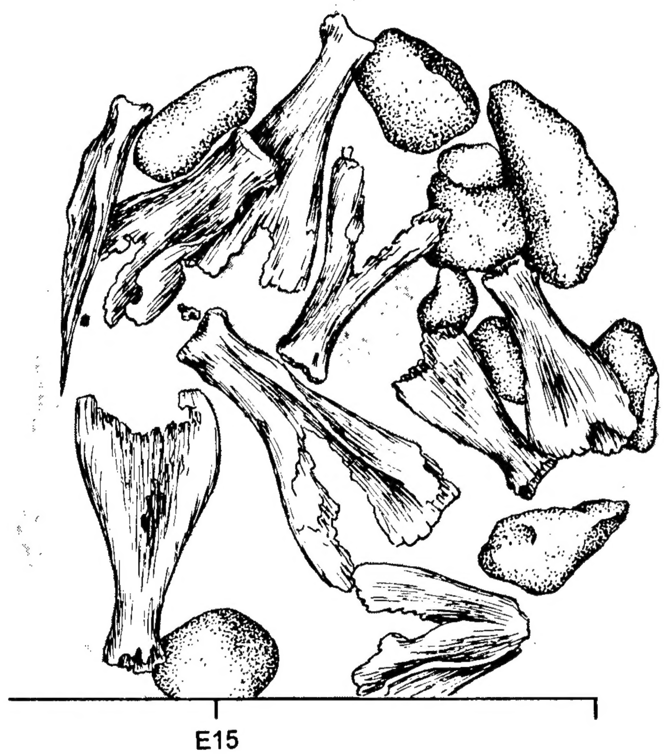
ARCHAEOLOGICAL INVESTIGATIONS AT FIVE PREHISTORIC SITES AT LEWISVILLE LAKE, DENTON COUNTY, TEXAS

by

C. REID FERRING and BONNIE C. YATES

With contributions by

K. L. BROWN
MARIE E. BROWN



CENTER FOR ENVIRONMENTAL ARCHAEOLOGY
University of North Texas

U.S. Army Corps of Engineers
Fort Worth District

DISTRIBUTION STATEMENT A:

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

DISTRIBUTION STATEMENT B:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES ONLY; (Indicate Reason and Date Below). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office Below).

DISTRIBUTION STATEMENT C:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS; (Indicate Reason and Date Below). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office Below).

DISTRIBUTION STATEMENT D:

DISTRIBUTION AUTHORIZED TO DOD AND U.S. DOD CONTRACTORS ONLY; (Indicate Reason and Date Below). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office Below).

DISTRIBUTION STATEMENT E:

DISTRIBUTION AUTHORIZED TO DOD COMPONENTS ONLY; (Indicate Reason and Date Below). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office Below).

DISTRIBUTION STATEMENT F:

FURTHER DISSEMINATION ONLY AS DIRECTED BY (Indicate Controlling DoD Office and Date Below) or HIGHER DOD AUTHORITY.

DISTRIBUTION STATEMENT X:

DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND PRIVATE INDIVIDUALS OR ENTERPRISES ELIGIBLE TO OBTAIN EXPORT-CONTROLLED TECHNICAL DATA IN ACCORDANCE WITH DOD DIRECTIVE 5230.25, WITHHOLDING OF UNCLASSIFIED TECHNICAL DATA FROM PUBLIC DISCLOSURE, 6 Nov 1984 (Indicate date of determination). CONTROLLING DOD OFFICE IS (Indicate Controlling DoD Office).

The cited documents has been reviewed by competent authority and the following distribution statement is hereby authorized.

A
(Statement)

Non-Sensitive arch/CRM site location data
(Reason)

DR. JAY R. NEWMAN
Jay R. Newman
(Signature & Typed Name)

CESWF-EV-EC
(Assigning Office)

CESWF-EV-EC
U.S. ARMY CORPS OF ENGINEERS
FT. WORTH DISTRICT
P.O. BOX 17300
(Controlling DoD Office Name)

819 TAYLOR ST.
FT. WORTH, TX. 76102-0300
(Controlling DoD Office Address, City, State, Zip)

8/24/98
(Date Statement Assigned)

REPORT DOCUMENTATION PAGE	*Form Approved OMB No. 0704-0188*

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	June 1998	Final 1988-1998

4. TITLE AND SUBTITLE
Archaeological Investigations at Five Prehistoric Sites at Lewisville Lake, Denton County, Texas

5. FUNDING NUMBERS
DACW63-86-C-0098

6. AUTHOR(S)
C. Reid Ferring and Bonnie C. Yates

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(ES)
Institute of Applied Sciences, University of North Texas

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAMES(S) AND ADDRESS(ES)
U.S. Army Corps of Engineers, Fort Worth District
P.O. Box 17300
Fort Worth, Texas 76102

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION AVAILABILITY STATEMENT
Approved for public release

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This report describes the results of excavations performed by the Institute of Applied Sciences at the Lewisville Lake project, Denton County, Texas. This field work, conducted in 1988, consisted of excavation of five prehistoric sites deemed elligible for nomination to the National Register of Historic Places. The prehistoric sites include Early/Middle Archaic to Late Prehistoric II occupations. New data were obtained pertaining to resource utilization, past environments, and adaptative strategies. These analyses documented changes in past environments and associated human responses. Adaptative strategies included changes in territoriality, raw material acquisition and faunal procurement.

Name of Federal Technical Responsible Individual: Jay R. Newman
Organization: U.S. Army Corps of Engineers, Fort Worth District, CESWF-EV-EC
Phone #: (817) 978-6388

14. SUBJECT TERMS	15. NUMBER OF PAGES
Prehistoric archaeology; cultural resources management	200
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Same as report

ARCHAEOLOGICAL INVESTIGATIONS AT FIVE PREHISTORIC SITES AT LEWISVILLE LAKE, DENTON COUNTY, TEXAS

by

C. REID FERRING
BONNIE C. YATES

With contributions by

K. L. BROWN
MARIE E. BROWN

Center for Environmental Archaeology
University of North Texas

Submitted in Partial Fulfillment of
Contract Number DACW63-86-C-0098
Fort Worth District, U.S. Army Corps of Engineers

1998

ACKNOWLEDGEMENTS

The authors would like to thank the many people who helped to accomplish the Lewisville Lake excavations. These people include the project director Ken Brown, the two crew chiefs George Brown and Bob Skiles. In addition to the excellent field work conducted by the crew chiefs, crew members did an outstanding job conducting excavations and laboratory work; they are listed below:

Field Crew

Robert Cast
Cliff Dorsett
Steve Gaither
Lilly Gholston
Tammie Green
Steve Hunt
Kim Jindra
Carole Medlar
Henri Migala
Elizabeth Mitchell
Laural Myers
Robert Perales
Kate Ray
Tracy Reid
Eric Roberts
John Mark Sheppard
Ken Vandersteen
Brad Weichsel
Craig Young

Lab Crew

Chris Brown
Marie Brown
Clint Grebe
Brian Ham
Layne Hedrick
Carin Horn
Diane Lehman-Turck
Carole Medlar
Evette Moorman
Susan Riley
LeeAnna Schniebs
Alice Stewart
Betty Lee Stringer
Scott Swartz

Special thanks go to the support of the Institute of Applied Sciences, including Gerald Blow, Pamella Carmichael, Brian Ham, Jeff McMahon, Jeff Bliesmer, and Tammy Green for graphics production; Bonnie C. Yates, Zooarchaeoloy Laboratory Director, for project management and editing; Tom Nelson for data file maintenance and computer programs; Jan Dickson for business management.

The authors wish to thank the many landowners who permitted crossing of their private lands to allow access to sites which otherwise would have caused delays and logistical problems. The Ft. Worth District, U.S. Army Corps of Engineers is thanked for their support during this project. In particular we thank Ms. Karen Scott and Mr. Jay Newman for their valuable support and encouragement during the project.

C. Reid Ferring, Principal Investigator
Bonnie C. Yates, Project Manager

Institute of Applied Sciences
University of North Texas
June 1998

TABLE OF CONTENTS

LIST OF FIGURES

List of Figures, cont.

LIST OF TABLES

List of Tables, cont.

CHAPTER 1: INTRODUCTION

This volume presents the results of archaeological investigations at five prehistoric sites located at Lewisville Lake in north central Texas (Figures 1.1, 1.2). These sites were determined to be eligible for inclusion in the National Register of Historic Places, following test excavations at a number of prehistoric sites located around the shoreline of Lewisville Lake. The results of the archaeological survey and the testing of both historic and prehistoric sites are reported in two volumes (Lebo and Brown 1990; Brown and Lebo 1990). That work

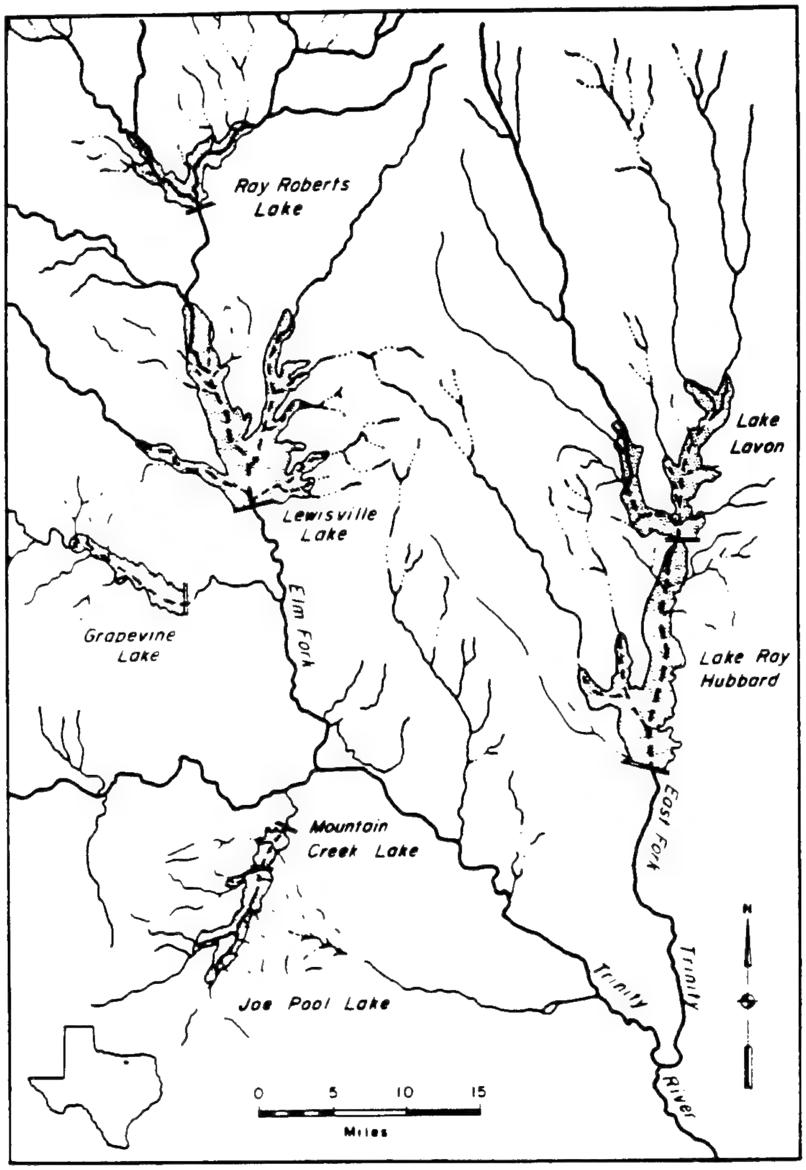


Figure 1.1 Map with location of the Lewisville Lake project area in relation to other reservoirs in northcentral Texas. Prehistoric site excavations at Ray Roberts Reservoir, conducted as part of the same project, are reported by Ferring and Yates (1997).

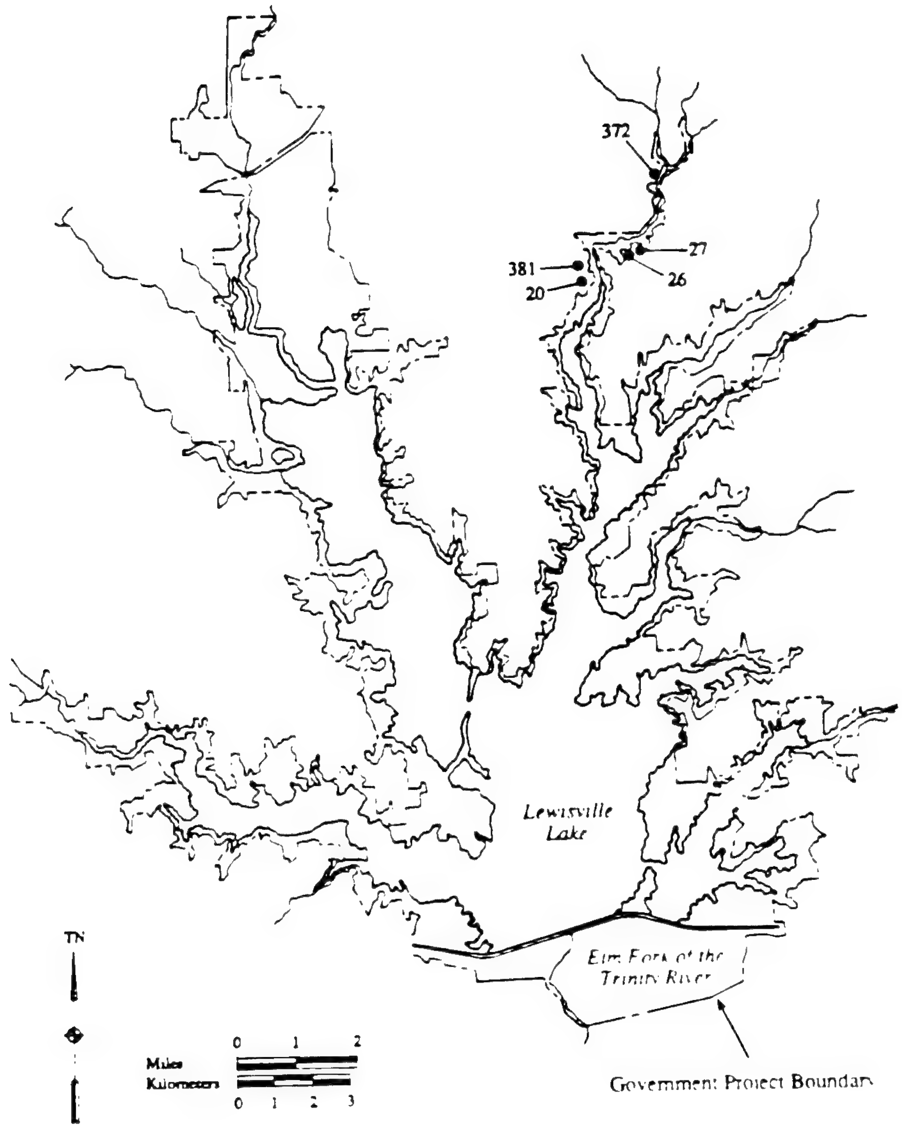


Figure 1.2 Map of Lewisville Lake with locations of the excavated sites. Note that the upper reach of Little Elm Creek is where suitable colluvial slope and/or terrace edge situations are exposed on the lake margins. Similar settings were found along the valley margin of the Elm Fork of the Trinity River, but site preservation was poor

was conducted by the Institute of Applied Sciences. University of North Texas (UNT), as part of contract DACW63-86-C-0098, with the Fort Worth District. U.S. Army Corps of Engineers (USACE), and was designed to identify potentially significant cultural resources that would be affected by raising the conservation pool level of Lewisville Lake. Mitigation efforts at several historical sites followed the program of site testing. Those studies are in Lebo (1997).

Approximately 14,000 acres around the shoreline were examined in the survey conducted by UNT in 1986-87. This periphery consists of land that will be affected by the pool raise planned for Lewisville Lake by controlled releases from the new reservoir Ray Roberts Lake, which is upstream 15 miles. The survey was restricted to land between the current conservation pool and the new 10-year flood elevation (531 MSL). The survey recorded 122 sites (Lebo and Brown 1990). Of these, 23 prehistoric and 15 historic sites were approved for further testing. Testing was conducted at these sites in the summer of 1988. As a result of testing efforts, five prehistoric sites and three historic sites were designated for mitigation.

Cultural resources investigations at Lewisville Lake and Ray Roberts Lake were conducted as part of the same contract between UNT and the USACE, and were conceptually and methodologically integrated. After mitigation fieldwork at Ray Roberts was completed, crews were shifted to Lewisville Lake to conduct the excavations reported here. Mitigation efforts at eleven prehistoric archaeological sites at Ray Roberts (Ferring and Yates 1997) resulted in collection and analysis of data from Middle Archaic, Late Archaic and Late Prehistoric occupations. On the Saturday following completion of the fieldwork at Lewisville Lake, the Aubrey Clovis Site (41DN479) was discovered in the outlet channel of Ray Roberts Lake (see Ferring 1989, 1990c, 1995a, and Humphrey and Ferring 1994 for preliminary reports). That discovery of a deeply buried and well preserved complex of Clovis archaeological remains led to another phase of field work and interdisciplinary study of rich paleoenvironmental data. Needless to say, the Aubrey Clovis site added a late Pleistocene - Clovis dimension to these projects that has no precedent in this region. The volume on the Aubrey Site will be the last report of the Ray Roberts-Lewisville series. Together these reports provide important evidence of past environments and adaptations by Paleoindian through Late Prehistoric culture groups in the north central Texas region. These efforts are more important considering that essentially no cultural resources investigations were undertaken at reservoirs in this region including Lake Texoma, the Lake Dallas (Garza-Little Elm) precursor to Lewisville Lake, Lake Grapevine and Lake Ray Hubbard (see Story 1990b for a comprehensive history of cultural resources management in this region). Limited work at Lake Lavon (Lynott 1975) and more comprehensive efforts at Joe Pool Lake (Peter and McGregor 1988) and farther south at Richland-Chambers Reservoir (Bruseth, McGregor and Martin 1987) are the principal studies of prehistoric archaeology in north central Texas.

Lewisville Lake, along with Ray Roberts Lake, occupies an important and challenging setting for prehistoric research. On a large scale, this area is at the bioclimatic transition from the forested Gulf Coastal Plain and the Southern Plains (Story 1990b, Ferring 1990a). Occupation of those two regions by cultures with very different socio-economic systems makes north central Texas of interest for any study of past cultural ecology. With somewhat different perspectives than those in vogue today, this regional significance was well appreciated by Krieger (1946), whose synthetic approach was not revisited until Lynott (1977) added new perspectives to regional prehistory.

On a more local scale, Lewisville Lake is situated at the ecotone between the Blackland Prairie and the Eastern Cross Timbers, as described in the following chapter. The juncture of these ecozones with the Elm Fork Trinity riparian communities signifies the potential to investigate synchronous use of these zones along with potential diachronic changes in adaptations as responses to environmental change. Geographically and ecologically, therefore, this area is important with respect to understanding prehistoric settlement and subsistence patterns as well as cultural relations. It was towards those potentials that this project was oriented.

CHAPTER 2 RESEARCH SETTING

Geologic and Physiographic Setting

Lewisville Lake is located in the upper part of the Elm Fork Trinity River drainage basin in North Central Texas (Figure 1.1). The overall setting for the project is the Upper Trinity River Drainage basin, as described below.

The Upper Trinity Drainage basin is located in north central Texas at the boundary between the southern Osage Plains and the Gulf Coastal Plain physiographic provinces (Fenneman, 1931; 1938). This drainage basin is bounded by three other major drainage basins: the Red River to the west, north and east; the Brazos to the west-southwest, and the Sabine to the east. Ecologically, the area is transitional from the southern prairie-plains to the East Texas forests.

Bedrock Geology

The entire Upper Trinity River drainage basin has developed over relatively soft late Paleozoic and Cretaceous sedimentary rocks (Hill, 1901; Shuler 1918; Winton 1925; Barnes 1967; 1988; Hendricks 1976). The West Fork Trinity River heads to the northwest of Fort Worth where Pennsylvanian sandstones and shales crop out. All other portions of the Upper Trinity drainage basin have outcrops of Cretaceous sedimentary rocks (Figures 2.1, 2.2).

In the Upper Trinity Drainage basin, the bedrock units exposed at the surface belong to Cretaceous stratigraphic units (Table 2.1). The lithologic differences among these sedimentary rocks are essential components of landscape evolution, including drainage network development, soils genesis and supply of alluvial parent materials.

With respect to Quaternary geologic and environmental history, the bedrock geology of the Upper Trinity River drainage basin is important for assessing bedrock as: a) a resistive component of landform evolution, b) parent materials for soils, and c) sources of alluvial, colluvial and eolian sediments.

Regional Geomorphology

Bedrock lithology is the principal factor that has influenced development of regional geomorphology. Four major upland geomorphic/physiographic subdivisions are recognized (Hill 1901; Fenneman 1938): Western Cross Timbers, Fort Worth Prairie, Eastern Cross Timbers and Black Prairie. Because climatic variation within this region is minor, differences in landforms, soils and vegetation among the four upland subdivisions are attributed to different bedrock lithology.

The Western Cross Timbers corresponds with the area underlain by the Antlers Formation (Figure 2.3). North of the West Fork Trinity River, the Antlers Fm. is comprised mainly of fine grained sandstones and some shales. South of the West Fork Trinity River, the correlative Twin Mountains, Glen Rose and Paluxy Fms. have more diverse lithology. The Western Cross Timbers is a rolling to deeply dissected area with sandy soils. Especially in the northern part of this area, steep canyons have been incised into the friable sandstone. Soils in the Western Cross Timbers are mainly Paleustalfs. The climax vegetation was an oak savannah (Dyksterhuis 1946, 1948). The overstory was dominated by Post Oak (Quercus stellata) and Blackjack Oak (Q. marilandica). Trees are more common in this area today than in pre-settlement time because of fire control. Grasses and a variety of forbs constitute the understory vegetation.

The area with outcrops of Antlers Sands is a major recharge zone for the Antlers aquifer farther east. As late as the 1920's numerous artesian wells flowed from this aquifer in the Dallas-Denton area (Hill 1901;

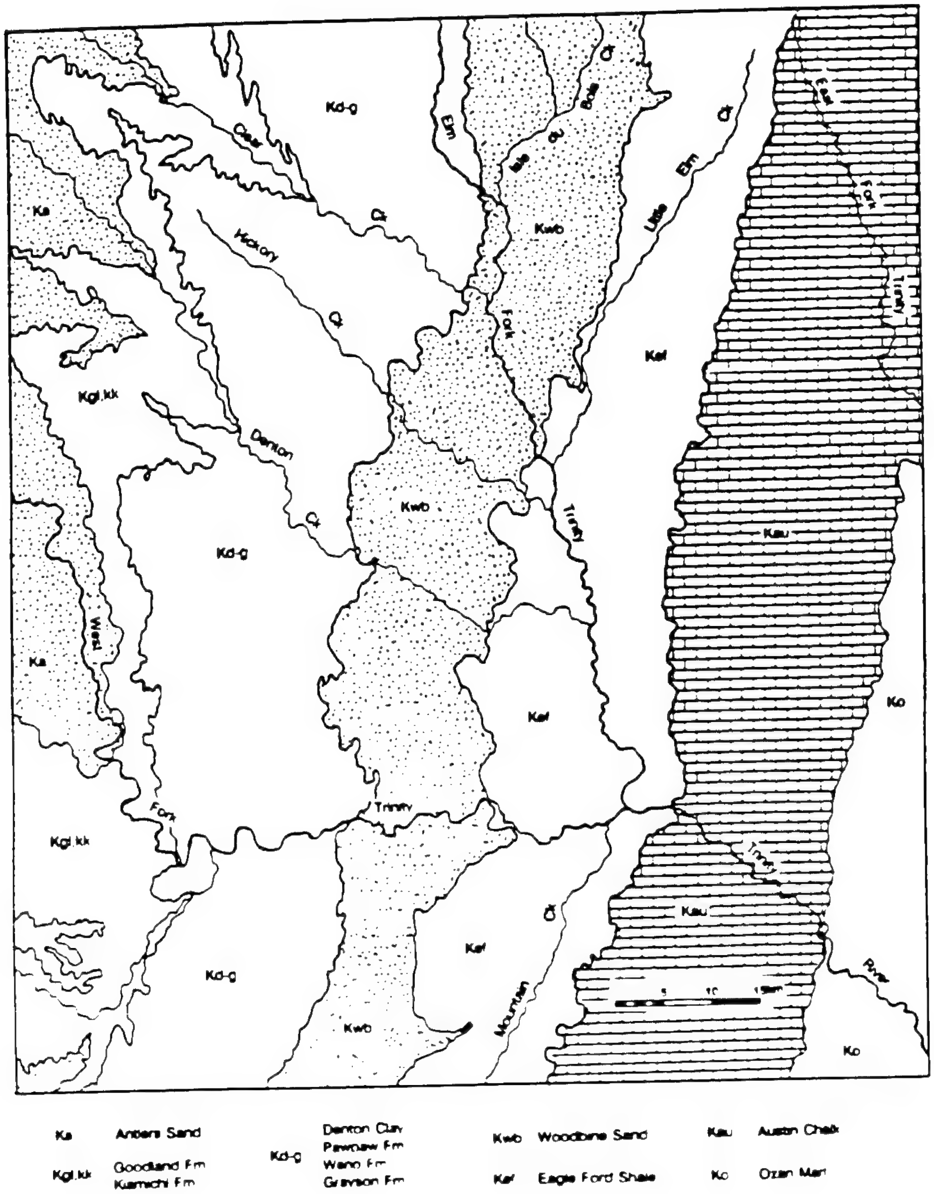


Figure 2.1 Bedrock geology of north central Texas

Shuler 1918). Today the Antlers remains an important aquifer in this region, although the great number of wells have stopped artesian flow.

The Fort Worth Prairie is the central portion of the Grand Prairie (Hill 1901). The Fort Worth Prairie corresponds with the area underlain by Cretaceous limestones and marls (from the Goodland Limestone in the west to the Grayson Fm. in the east). Differences in bedrock lithology have promoted development of local differences in landforms within the Fort Worth Prairie. Overall, this subdivision is comprised of level to somewhat rolling surfaces that follow the gentle (ca. 25 feet/mile) bedrock dip to the east. Stream valleys tend

Table 2.1 CRETACEOUS STRATIGRAPHY OF NORTH CENTRAL TEXAS

STRATIGRAPHIC UNIT	Thickness (feet)	LITHOLOGY
Upper Cretaceous		
Austin Chalk	400-600	massive chalk with thin marl interbeds; weathers white
Eagle Ford Group	250-350	selenitic shales with thin sandstone beds and calcareous concretions; weathers gray
Woodbine Formation	200-350	predominantly fine grained sandstones with thinner shale beds and members. Weathers red with numerous ferruginous concretions.
Lower Cretaceous		
Grayson Marl	30-60	marl and calcareous clay with few thin limestone beds. weathers yellowish brown.
Main Street Limestone	10-25	fossiliferous limestone and calcareous shale. weathers light gray to white.
Pawpaw Formation	15-50	sandstones with shale interbeds. Many ferruginous concretions. weathers brown.
Weno Limestone	60-130	marl and limestone; many concretions, fossiliferous. weathers gray.
Denton Clay	20-45	calcareous shaley clay and thin limestones; weathers brownish gray.
Fort Worth Limestone	25-35	massive and burrowed limestone with thin marl interbeds; fossiliferous, weathers yellowish brown.
Duck Creek Formation	50-100	fossiliferous limestone with thin marl interbeds. weathers yellowish brown.
Kiamichi Formation	20-50	marl and thin limestone with a few thin calcareous sandstones. weathers yellowish gray and brown.
Goodland Limestone and Walnut Clay	30-90	massive and nodular limestone with beds of marl and clay. weathers dark gray to brown.
Antlers Sand	500-650	sand, clay and conglomerate; carbonates increase to south. weathers yellowish brown.

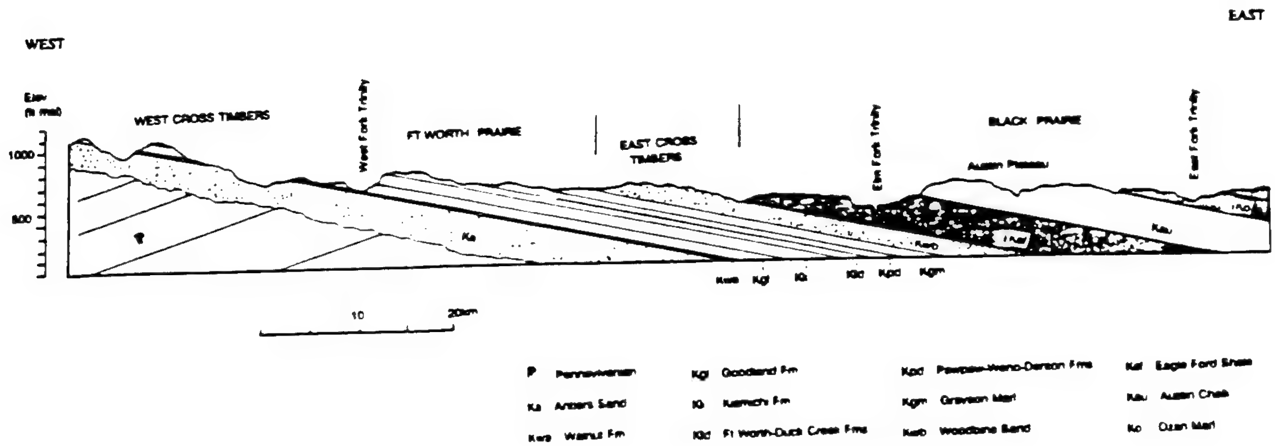


Figure 2.2 Geologic cross-section of the upper Trinity Valley.

to be deep and steep-sided. Soils in the Fort Worth Prairie vary according to specific bedrock parent material. Most of the upland soils are Chromusterts, Calciustolls or Haplustolls, while Paleusterts and Paleustalfs have lessor areal extent (Ford and Pauls 1980).

The East Cross Timbers subdivision is a north-south belt of low hills and moderately dissected land that corresponds with outcrops of the Woodbine Sandstone. This subdivision is similar to the western Cross Timbers in that Paleustalf soils, in deep sandy parent material, are most common. Edaphic controls on vegetation are also similar, as Oak forests are main components of the climax vegetation. Because the Woodbine Fm. is thinner than the Antlers, the East Cross Timbers is narrower than the West Cross Timbers.

The Black Prairie subdivision is immediately east of the Eastern Cross Timbers, and occurs over outcrops of the Upper Cretaceous Eagle Ford Shale, Austin Chalk and Ozan Marl (Figures 2.1, 2.2, 2.3). Thick calcareous and clayey soils are predominant in this subdivision, and the native vegetation was comprised of mixed grass prairies. The Austin Chalk is much more resistant to erosion than the shales and marls on either side. A result is the prominent in facing "White Rock Escarpment", a steep cuesta that overlooks the Elm Fork Trinity and Mountain Creek valleys. North and south of Dallas, the area of Austin Chalk outcrops has eroded to form a tableland blanketed by deep, black Vertisols- the Houston Black Clay soils. The more easily eroded Eagle Ford shales have been sculpted into valleys that separate the Woodbine Sandstone hills from the White Rock plateau.

In the Lewisville Lake area the Woodbine Fm. crops out along the western part of the lake. These are generally resistant rocks, and are often covered by alluvium of terraces that form benches along the west side of the Elm Fork Trinity. The contact with the overlying Eagle Ford Fm. Extends north-south through the middle of the lake area. The outcrops of the Eagle Ford shales in the eastern part of the project area have lower relief and have wqeathered into clayey soils of the Blackland Prairie (Figure 2.3).

Drainage Systems

The West Fork Trinity River is the consequent stream of the Upper Trinity River Drainage Basin (Figure 2.4). The West Fork Trinity River headwaters are in the area of Pennsylvanian rocks west of the

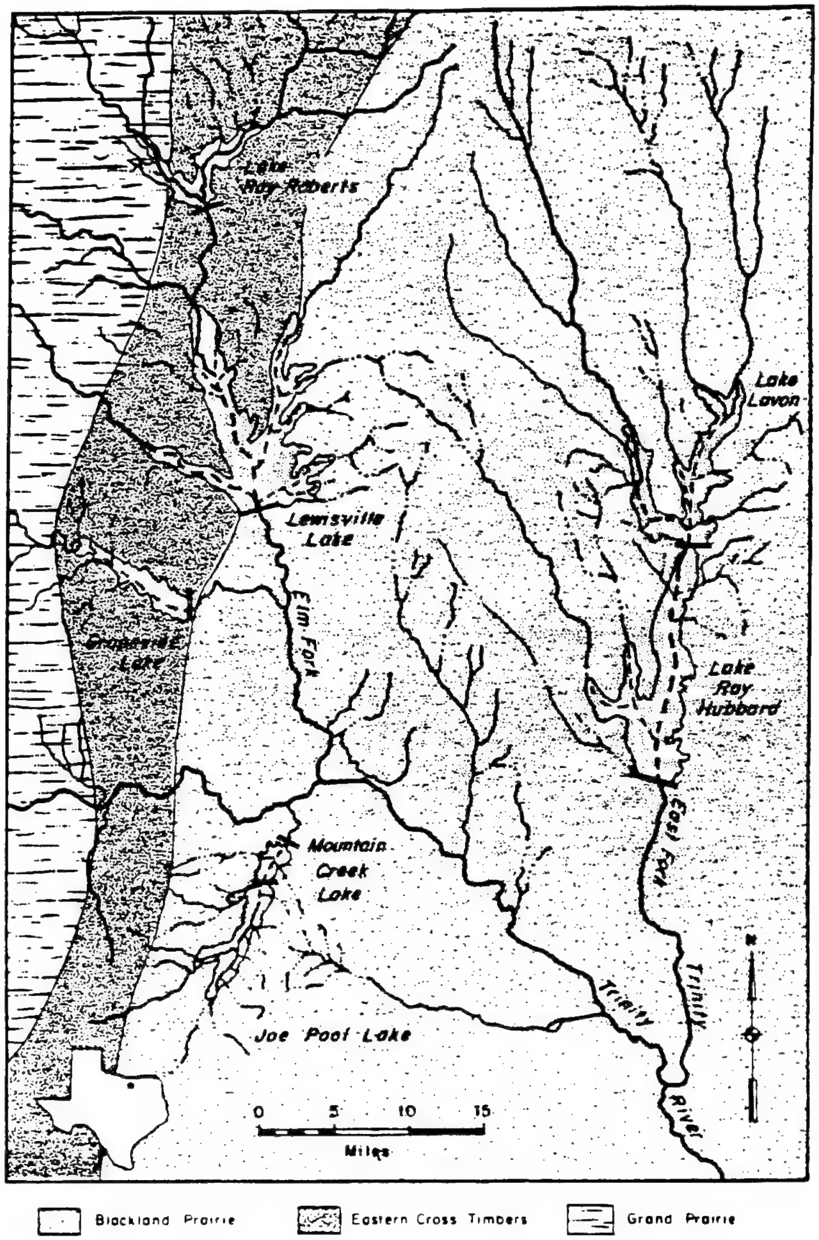


Figure 2.3 Regional Vegetation for the Lake Lewisville Area.

Pennsylvanian-Cretaceous unconformity. The West Fork is superposed over the resistant Woodbine and the Austin Chalk. The Elm Fork Trinity River and Mountain Creek are subsequent drainages. Major obsequent tributaries to the Elm Fork include Clear Creek, Hickory Creek and Denton Creek. These drainages all follow regional bedrock dip, and have elongated dendritic patterns (Figure 2.4). Shorter, steep resequent streams flow off the western slope of the Austin Chalk escarpment.

Because of different bedrock lithologies in the Elm Fork Trinity and the Little Elm Creek drainages, alluvial sediments along these streams are very different. The Holocene alluvium along the Elm Fork is clay and silt, while sands are dominant in the Holocene alluvium of Litttle Elm Creek. These differences have important consequences in terms of site formation processes, as discussed later in this report. It is likely that these differences in sediments also influenced vegetation patterns along flood plains during the Holocene. Low

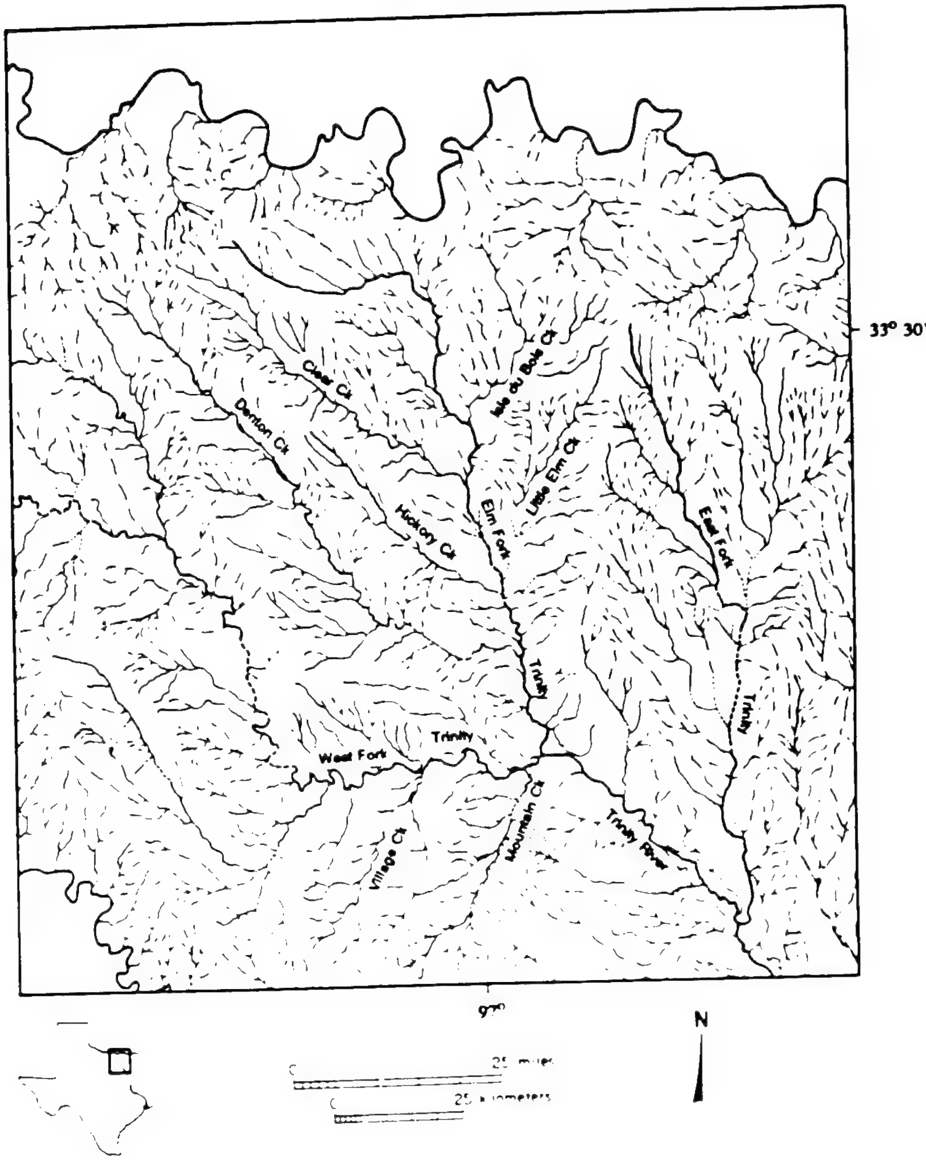


Figure 2.4 Drainage networks in north central Texas

sandy terraces along Little Elm Creek were probably better drained. and probably supported more Oaks in the riparian galleries. Clayey, calcareous soils along the Elm Fork probably supported a richer undergrowth and fewer oaks. Proximity of prairie habitats east of the Elm Fork probably had an important effect on resource procurement for sites in that entire project area

Climate

This part of Texas has a humid, subtropical climate. Summers are hot and winters are mild except for brief periods of cold temperatures associated with arctic fronts called "northers". Precipitation and temperature data (1931-1969) show that late spring and early fall are the wettest months, while summer temperatures are high and rainfall is low (Figure 2.5). Occasionally, tropical storms reach this area causing severe flooding. Normal overbank flooding is common in the spring months when Pacific air masses collide with warm Gulf air.

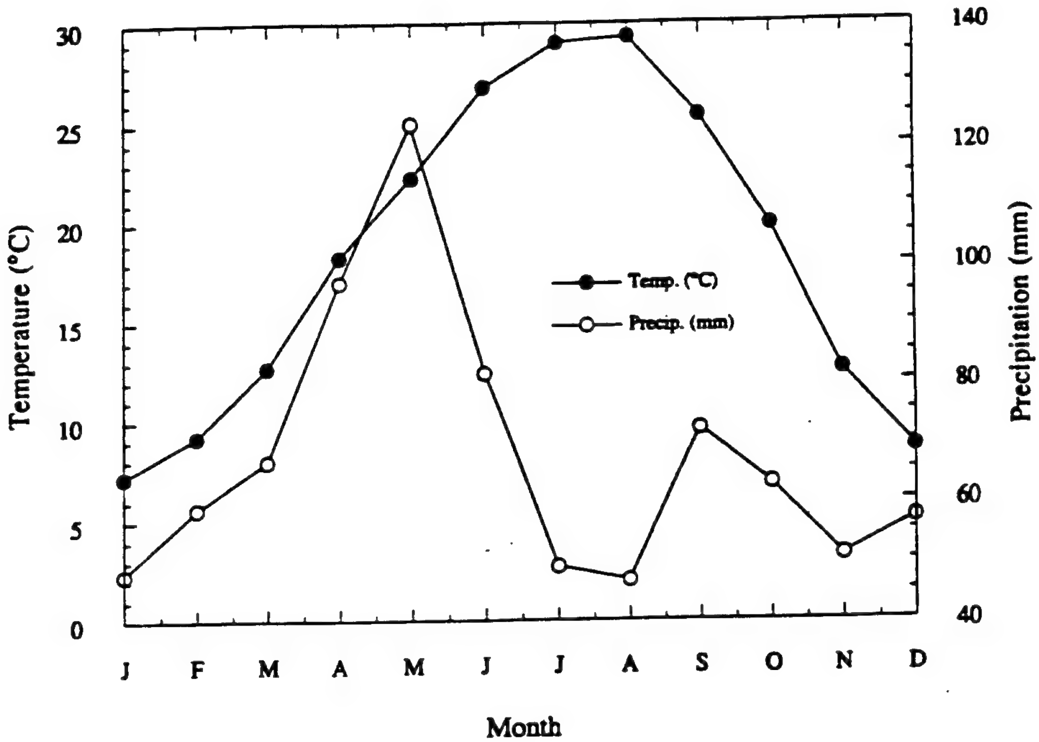


Figure 2.5 Climatic Data for Denton County, 1939-1989. (From Ford and Pauls 1980).

Average rainfall in Denton County is 813 mm/yr (32 in/yr) (Ford and Pauls 1980) and the region is ecotonal between the Prairie Plains to the west and the pine-broadleaf forests in east Texas. Because of the moderate climate, edaphic controls on vegetational patterns are distinct. Limestones and marls with calcareous soils support prairie ecosystems, while oak savannas (the "Cross Timbers") occur in areas underlain by sandstones. Indeed, a characteristic of this region is its mosaic of soils; calcic Mollisols and Vertisols are associated with calcareous bedrock and alluvium, while Alfisols are associated with sandstone bedrock and sandy alluvium.

Biotic Resources

The biotic resources in this part of Texas must be considered at several scales for defining contexts of prehistoric archaeological sites. On a local scale, drainages, landforms and soil types probably were important in defining loci for occupation or resource exploitation activities. This scale is evident within the project area. At a regional scale, major environmental zones, such as the Cross Timbers or Fort Worth Prairie, probably conditioned patterns of periodic or seasonal movements and were important factors in determining multisite locational patterns. At a still larger scale, the Upper Trinity basin is situated at a boundary between major physiographic provinces (the Gulf Coastal Plain and the Southern Plains), and near a major regional drainage, the Red River. With respect to interpreting the prehistoric archaeological record at Lewisville Lake, we will focus on the smaller scale ecological parameters, but will later consider the regional position of the project area with respect to broader or diachronic patterns of archaeological variability.

Lewisville Lake lies within Dice's (1943) Texan bioticprovince. It is a discrete geographical area within which distinct plant and animal communities, reaching their eastern and western extremes, overlap (Blair 1950; Webb 1950). It is a diverse area where the flora and fauna of three distinct ecological zones, the eastern woodlands, the prairies, and riparian stream courses, occupy a patchy mosaic.

The predominately clayey soils of the prairies support tall to mid-size grasses with scattered oak trees in the uplands and fingers of riparian communities along stream courses. By contrast, the Eastern Cross Timbers consists of sandy upland soils supporting dense groves of post oaks and greenbriar with an understory of big and little bluestem, switchgrass, lovegrass, and many kinds of forbs and legumes. On the floodplains in the Cross Timbers, overstory vegetation consists of elms, pecans, oaks, cottonwoods, and willows as part of the riparian assemblage; understory vegetation includes various frutescents as supplements to a rich variety of mast-producing trees, thus providing various fruits, such as plums and berries, and nuts. Vegetation along the stream courses within the prairie zones functions as riparian habitat and consists of virtually the same overstory species as found in the temperate woodlands of the Cross Timbers (Dyksterhuis 1946, 1948; Hill 1901; Urbanovsky 1972). These bottomlands were probably the most significant part of the entire region in terms of the exploitative strategy of prehistoric peoples (Lynott 1977). Most large game species would have concentrated in greater numbers within the bottomland forest zone. This would have been especially true during fall and winter when acorns ripen and fall and when some late fruits like persimmons finally ripen. The bottomlands supported a great variety of resources, including the all-important deer, raccoon, opossum, rabbit, squirrel, and wild turkey. Seasonal resources include migratory birds, especially waterfowl which feed along aquatic margins, spawning fishes, most amphibians and reptiles, which are more active in warmer seasons, floral products (berries, fruits, and nuts), and insects (Marmaduke 1975; McCormick et al. 1975; Shaw 1978).

Other animals represented archaeologically in the area include pronghorn, cottontail, jackrabbit, cotton rat, beaver, dog, coyote, wolf, badger, birds, lizards, terrestrial and aquatic turtles, and a great variety of birds. In all, at least 49 species of mammals, 39 species of reptiles, 20 species of amphibians, and 239 species of birds are found today in the project area (Blair 1950; Coster et al. 1972).

Dyksterhuis (1948:327) recounts the origin of the name "Cross Timbers" as unrecorded but "presumably alludes either to the fact that this forest extends north and south across, rather than along, the major streams all of which flow eastward"; he further notes that the Indians and trappers used it as a landmark when they wished to sketch their expeditions, by first drawing a vertical line to represent the forest, then an intersecting one to indicate the route.

Nineteenth-century travelers through this part of Texas provide eyewitness accounts to what the landscape might have looked like at least toward the end of the late prehistoric period. Kendall (1845:115) reported that the sojourners could expect the Cross Timbers to be "a singular strip of wooded country [with] an almost impenetrable undergrowth of brier."

He went on to describe what the environment had to offer

> Here and there he will also find a small valley where the timber is large and the land rich and fertile, and occasionally a small prairie intervenes: but the general face of the country is broken and hilly, and the soil thin. On the eastern side of the Cross Timbers the country is varied by small prairies and clumps of woodland, while on the western all is a perfect ocean of prairie. . . . In the Cross Timbers, we found the face of the country broken, and full of deep and almost impassable gullies. These, in the rainy season, carry off the waters from the hills to the larger streams outside the woods, but in July we found them all dry. . . .
>
> Bear and deer are found in the Cross Timbers and the vicinity, and small gangs of buffalo take shelter in them when scattered and driven from the prairies by Indians. (Kendall 1845:115-119)

Evidence of bison is found at a few prehistoric sites. The tall and mixed grass prairies probably did not support large herds of bison or pronghorn, which prefer short grass prairies found farther west and south, but the area would at least have supported smaller herds. Hornaday (1887:426) lists several grasses consumed by bison, but the only one listed that grows this far east is little bluestem (<u>Andropogon scoparius</u>) (Dysterhuis

(1946), which could have supported small groups. Most importantly, the stream courses would have attracted straggling migrants into the area; and it is in the riparian sites that evidence of bison is seen prehistorically. Buffalo were hunted well into the settlement period. They were numerous in the 1830s but were essentially extirpated before the mid-1840s.

Early settlers in Denton County reported that wild game was plentiful, including prairie chickens, quail, turkey, ducks, geese, beaver, deer, and antelope. Less numerous, if ever seen, were "ground hogs," which were probably mistaken as prairie dogs (Cynomys ludovicianus) (Bridges 1978:36).

Table 2.2 lists all of the faunas represented in the prehistoric archaeological assemblages under the present study. They are organized by vertebrate class, and notation is made of the habitat preference of each. Cases where uncertainty of the taxonomic identification exists are indicated appropriately.

Table 2.2 Identified Genera and Species at Lewisville Lake

TAXON	HABITAT
Osteichthyes - Bony Fish	
Lepisosteus spp. (Gar)	A
Amia calva (Bowfin)	A
Ictalurus punctatus (Channel Catfish)	A
Ictalurus spp. (Catfish)	A
cf. Lepomis spp. (?Sunfish)	A
Aplodinotus grunniens (Freshwater Drum)	A
Amphibia - Amphibians	
Ambystoma sp. (Mole Salamander)	V
cf. Bufo woodhousei woodhousei (?Woodhouse's Toad)	B
cf. Scaphiopus sp. (?Spadefoot Toads)	G, W
Rana catesbeiana (Bullfrog)	A
Reptilia - Reptiles	
Chelydra serpentina (Snapping Turtle)	A
Macroclemys temmincki (Alligator Snapping Turtle)	A
Sternotherus spp. (Musk Turtles)	A
Kinosternon spp. (Mud Turtles)	A
Terrapene spp. (Box Turtles)	G, W
Graptemys sp. (Map Turtle)	A
Chrysemys scripta elegans (Red-eared Turtle)	A
Chrysemys spp. (Basking Turtles)	A
Trionyx spp. (Softshell Turtles)	A
Phrynosoma cornutum (Texas Horned Lizard)	G
Sceloporus olivaceus (Texas Spiny Lizard)	W
cf. Cnemidophorus gularis gularis (?Texas Spotted Whiptail)	G
cf. Cnemidophorus sp. (?Whiptail)	G
cf. Thamnophis proximus proximus (?Western Ribbon Snake)	B
Elaphe sp. (Rat Snake)	V

Table 2.2, cont.

Aves - Birds	
Buteo jamaicensis (Red-tailed Hawk)	G, WE
Tympanuchus sp. (Prairie Chicken)	G
Colinus virginianus (Bobwhite)	G, WE
Meleagris gallopavo (Wild Turkey)	W, WE
Fulica americana (American Coot)	A
Sturnella sp. (Meadowlark)	G
Cardinalis cardinalis (Cardinal)	WE
Mammalia - Mammals	
Didelphis virginiana (Oppossum)	B, W
Scalopus aquaticus (Eastern Mole)	W
Dasypus novemcinctus (Nine-banded Armadillo)	W
Sylvilagus floridanus (Eastern Cottontail)	W, WE
Sylvilagus aquaticus (Swamp Rabbit)	B
Lepus californicus (Black-tailed Jack Rabbit)	G
Spermophilus tridecemlineatus (Thirteen-lined Ground Squirrel)	G
Sciurus niger (Fox Squirrel)	W, B
Sciurus carolinensis (Gray Squirrel)	B
Geomys bursarius (Plains Pocket Gopher)	G
Perognathus sp. (Pocket Mouse)	G
Castor canadensis (Beaver)	A
Reithrodontomys sp. (Harvest Mouse)	G
Peromyscus spp. (White-footed Mice)	V
cf. Baiomys taylori (?Northern Pygmy Mouse)	G
Onychomys leucogaster (Northern Grasshopper Mouse)	G
Sigmodon hispidus (Hispid Cotton Rat)	G
Neotoma sp. (Woodrat)	B, W
cf. Microtus ochrogaster (?Prairie Vole)	G
Microtus spp. (Voles)	W, G
Canis sp. (Coyote, Dog, and Wolf)	V
Vulpes vulpes (Red Fox) and/or	WE, B
Urocyon cinereoargenteus (Gray Fox)	W, WE
Procyon lotor (Raccoon)	B, W
Mustela vison (Mink)	B
Taxidea taxus (Badger)	G
Mephitis mephitis (Striped Skunk)	WE
Odocoileus virginianus (White-tailed Deer)	WE
Antilocapra americana (Pronghorn)	G
Bison bison (Bison)	G

Key:

A = aquatic (rivers, swamps, marshes)
B = bottomlands (riparian habitats)
G = grasslands (brush, prairies)
V = various (more than one habitat)
W = woodlands (deciduous or pine forests)
WE = wooded edges (open meadows, parkland)

Shellfish constitute another faunal resource found in large amounts at some of the archaeological sites. Read (1954) has recorded 30 species of unionids in Dallas County to the south, and he credits the various kinds of stream bottoms in the Trinity River watershed to this diversity. Short-term dry periods throughout the year would create low water levels at which times shellfish could be collected from pools in the creek beds (Lynott 1977:36).

In summary, Lewisville Lake is a broadly ecotonal area, where distinct ecological communities converge. The area is comprised of grassland, forest, and riparian habitats, which maintain diverse fauna and flora from biotic regions to the east and west.

Lithic Resources

Definition of lithic resources is an essential aspect of analysis of prehistoric sites because the durability of lithic artifacts ensures that they can be used to infer patterns of raw material selection, procurement and processing. The North Central Texas region is notable for its paucity of knappable lithic raw materials (Banks 1990). For purposes of assemblage analysis, it is possible to define lithic resources in three categories: local, regional and exotic. Local resources are those that are available within the project area, and therefore within easy walking distance of sites. Regional sources are those that are not within the project area, but are within the North Central Texas region. Exotic resources are those that occur naturally outside the region.

<u>Local resources</u> are limited in terms of petrology. These include: a) upland concentrations of Ogallala metaquartzite, quartzite and fossil wood that derive from highly dispersed remnants of Tertiary gravels; b) ferrocrete sandstones and hematite that derive from deeply weathered soil horizons in the Woodbine Sandstone and c) local sandstones and limestones that were usually used for grinding stones or hearth stones. Despite the fact that these lithic resources are "local", geologic surveys indicate that their specific sources are not areally uniform. Small cobbles of Ogallala quartzite may be found in most alluvial gravels, especially those associated with terraces. One outcrop of large boulders (up to 25 cm) of fine-grained Ogallala quartzite was found in channel deposits of probable Tertiary to early Pleistocene age on hill tops and high slopes along Isle du Bois Creek at Ray Roberts Lake. These large cobbles and boulders could have been a "quarry source" for Ogallala raw materials that may have been specifically exploited.

<u>Regional resources</u> include raw materials of "local" types, but also include cherts and orthoquartzites that occur in Pennsylvanian rocks west of the project area and also occur in gravels of the West Fork Trinity, Denton Creek and Clear Creek. The cherts are varied, including many colors of cryptocrystalline chert and fossiliferous chert. In the Ray Roberts assemblages, the vast majority of "cherts" are regional cherts, and most evidence (especially cortex type) points to gravel sources for these materials. Some of the quartzites are distinct from "Ogallala" in that they contain multicolored chert and quartz grains. Many of the "regional" cherts are difficult to distinguish from Edwards chert from central Texas (Banks 1990). Procurement of regional cherts implies a greater exploitative area than use of local materials, but not necessarily trade or exchange.

<u>Exotic resources</u> include a variety of materials that are distinctive as to petrology and source. These are very rare in assemblages from Ray Roberts Lake, and mainly include Edwards chert. Individual types are mentioned within site discussions. Use of exotic materials implies but does not confirm procurement via trade or exchange.

Late Quaternary Geology

Considerable progress has been made in defining morphostratigraphic and allostratigraphic units in the Upper Trinity River Drainage Basin in the past ten years. The majority of this research has been sponsored by the Ft. Worth District, USACE, including research at Lewisville Lake and Ray Roberts Lake. The following summary is developed from that research, and provides a contextual basis for archaeological analyses at Lewisville Lake.

Alluvial Stratigraphy and Geochronology

Analysis of borehole data, description of sections exposed in channel cuts and gravel pits, and excavation of backhoe trenches and archaeological profiles have been used to define the lithostratigraphic units. A significant increase in the number of radiocarbon ages has also been realized through recent research. The stratigraphic units described below include some that were formally or informally defined earlier (Ferring 1990b, 1993). The stratigraphy is first arranged according to morphostratigraphic units (terraces and floodplain), then by alluvial units within each morphostratigraphic unit (Figure 2.6).

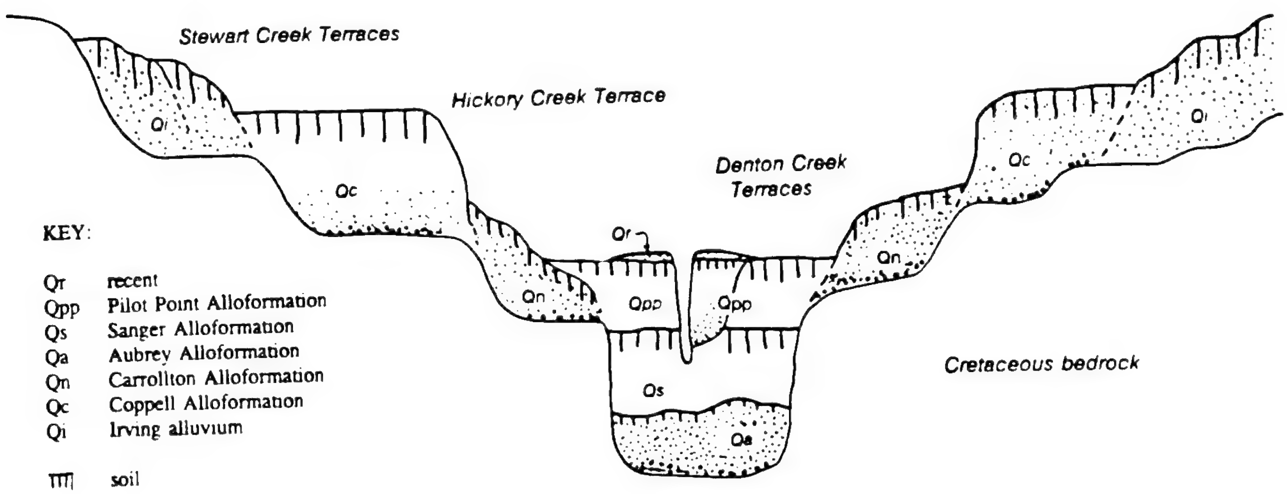


Figure 2.6 Schematic geologic cross-section of the upper Trinity River Valley.

Stewart Creek Terraces

Along the Elm Fork and West Fork Trinity are discontinuous and dissected terraces that are higher than the Hickory Creek Terrace (Figure 2.6). These were called Marsalis by Taggart (1953) and a variety of names (eg. Buckner Home, Hackberry Creek, Travis School) by Crook and Harris (Slaughter et al. 1962). They were called "high terraces" by Ferring (1986c; 1990b). As informally defined here, the Stewart Creek terraces include strath surfaces with veneers of quartzite and metamorphic cobbles (Menzer and Slaughter 1971), as well as terrace remnants underlain by alluvium. Alluvial fill of some of these terraces has been initially studied at an exposure in Irving, and is described in borehole logs for Lewisville Dam (Ferring 1986c). At both of these localities the terrace surface is approximately 32 m (105 ft) above the Elm Fork Trinity flood plain. It is probable that more than one terrace occurs above the Hickory Creek, yet substantial work is needed to define these.

The age of the Stewart Creek terraces is not known, but based on geomorphic position and soil development these surfaces appear to be at least middle Pleistocene. In the Lewisville Lake area Stewarts Creek Terraces contain lags of Ogallala quartzite, and are marked by very strongly developed soil in sandy alluvium. The alluvium associated with these terraces is informally designated as the Irving alluvium.

Irving alluvium. This unit is informally defined as the alluvium that occurs between bedrock benches and the surface of the Stewart Creek terraces. Borehole logs and quarry exposures show this alluvium to be heterogeneous. At an exposure in Irving, this unit includes matrix supported pebble and cobble gravel overlain by at least 5 m of yellowish brown loamy alluvium. A strongly developed Alfisol with a thick red argillic horizon has formed at the surface of the alluvial parent material. Borehole data from the Lewisville Lake Dam show that 7-8m of Irving alluvium below the surface of the Stewart Creek terrace is dominated by silts and clays, with thin sand and gravel near the base of the section (Figure 2.6).

Hickory Creek Terrace

This terrace was formally defined by Ferring (1990b). The Hickory Creek Terrace is the most clearly expressed terrace along the Elm Fork Trinity Valley. It is a broad, very flat terrace that is frequently matched on both sides of the valley. The terrace is less dissected than the sandier terraces above and below. It has been mapped from Valley View, Texas to south of Dallas, a distance of over 60 miles (100km). The same terrace can be traced up larger tributaries of the Trinity; broad exposures are present along Ten Mile Creek, Mountain Creek, Denton Creek, Hickory Creek, Clear Creek and Isle du Bois Creek (Figure 2.4). The terrace occurs along the eastern side of Lewisville Lake, and northwards between the Little Elm Creek drainage and the Austin Chalk escarpment (Figures 2.1, 2.2). Reflecting local bedrock sources of sediment, the alluvium associated with this terrace is clay-silt on the east and sandy on the west. Despite its generally clear geomorphic expression in the field, this terrace is difficult to "find" in the confusing array of older terrace nomenclature. Both Shuler (1935) and Taggart (1953) identified this as the Love Field terrace at Dallas, and Taggart did a good job of mapping the terrace upstream. The Hickory Creek Terrace is the same as Crook's Lewisville ("T2") at Lewisville (Crook and Harris, 1957), yet he incorrectly placed that terrace below his Love Field ("T4") and his Travis School ("T3") at Dallas.

Two alluvial units have thus far been defined as part of the alluvial fill of the Hickory Creek Terrace. No prehistoric sites associated with this terrace were studied at Lewisville Lake, although a number of historic sites occur on this surface, as the clay alluvium was fertile (Lebo 1996).

Coppell Alluvium. The type section for the Coppell Alluvium is located in a gravel pit east of Valley View, Texas (Ferring 1990b). This section (Profile 922B) is a few hundred meters west of site 41CO150 (Ferring and Yates 1997). The base of the unit is bedrock and the upper boundary is the surface of the Hickory Creek Terrace. At the type section, and in most other localities, the Coppell Alluvium has gravel and/or sand in the lower part of the section. The gravel is matrix or clast supported pebbles and cobbles that are sometimes cemented by calcite or hematite. Clasts are mainly limestone rock fragments, rolled Cretaceous megafossils and rolled hematite/limonite concretions. The gravel and sand are overlain by calcareous clay loam and silty clay loam that comprise most of the section. Pedogenic and probable groundwater carbonate concretions are common in the section, below the leached soil horizons at the surface. A strongly developed Mollisol or Vertisol has formed at the surface in the fine-grained parent material. Pleistocene vertebrate and invertebrate fossils are common, especially in the middle and lower parts of the sections.

The Coppell Alluvium occurs as fill of the Hickory Creek Terrace along reaches of the Elm Fork and West Fork Trinity that received calcareous, fine-grained alluvial sediments. These deposits appear sandier south of the confluence with the West Fork Trinity, which has appreciable sandy bedload.

The Coppell Alluvium is considered to be early to middle Wisconsin in age (Oxygen isotope Stages 5a to 3 or 4). Geomorphic and sedimentary data suggest that the Hickory Creek Terrace formed over a very long interval. The upstream sections, on Clear Creek and on the Elm Fork near Valley View (Figure 2.7) show that the channel bases were on bedrock. Thus, the upstream sections of Coppell Alluvium appear to reflect headward growth of the valley and upstream construction of the Hickory Creek flood plain. In the Lewisville-Dallas area, the extremely broad Hickory Creek Terrace is evidence for prolonged flood plain widening during the course of Coppell aggradation.

Faunal data also suggest a prolonged period of alluvial deposition. Faunas from the Coppell-Tioga alluvium were initially considered to be Sangamon in age (Slaughter et al., 1962). A Wisconsin age was suggested by Hibbard (1970), and Slaughter (1966) later noted ecological variability among the faunas suggesting that the younger Moore Pit faunas were of Wisconsin age. Slaughter (1966) also noted similarities between the Clear Creek local fauna and the upper Moore Pit faunas from near Dallas. While it may not be possible to seriate these faunas taxonomically, the patterns of ecological variability noted by Slaughter are most easily explained by reference to the geomorphic-sedimentary genesis of the Hickory Creek terrace and Coppell Alluvium. It appears that the early Coppell Alluvium occurs in downstream settings, below younger Coppell Alluvium. The earlier Coppell Alluvium contains Rancholabrean vertebrate faunas indicative of moist climates.

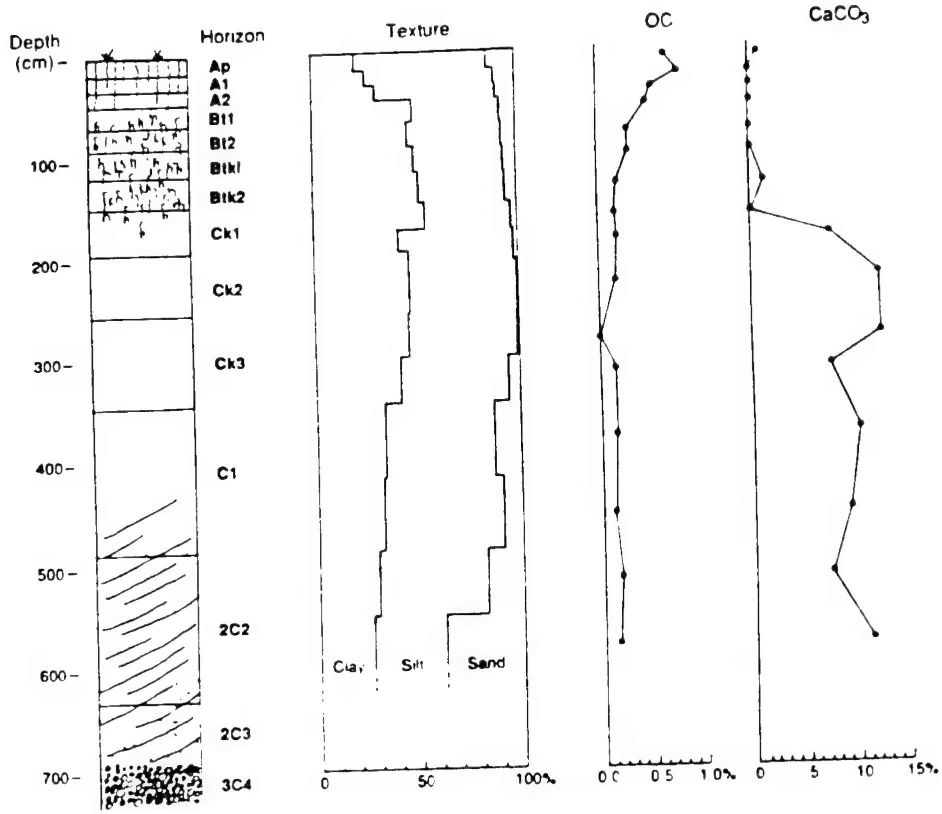


Figure 2.7 Geologic section of Locality 922B. Section is on Elm Fork of the Trinity, east of Valley View.

The younger Coppell Alluvium is present in two settings: a) stratified above the younger Coppell in downstream settings, and b) as the complete Coppell sections in upstream settings. The younger Coppell Alluvium has yielded faunas indicative of climatic conditions drier than those of early Coppell time.

The early Coppell Alluvium probably dates to early to middle Wisconsin (Slaughter 1966; Slaughter and Ritchie 1963; Cheatum and Allen 1963; Holman 1963). The late Coppell Alluvium most reasonably dates to the middle Wisconsin (Isotope Stage 3 or 4). Correlatives of the Hickory Creek Terrace and Coppell Alluvium include the "T2" along the East Fork Trinity River, with faunas similar to the Moore Pit Fauna (Thurmond 1967) and the Trinity terrace and Wisconsin faunas south of Dallas near Trinidad, Texas (Stovall and McAnulty 1950).

While the single radiocarbon age from the younger Coppell Alluvium, from the Clear Creek locality, should be suspect, the age (28,840 +/- 4,740) may not be unreasonable. This age should be checked by additional radiometric dating, including Uranium series or ESR, but also by further attempts to date the younger Coppell Alluvium with radiocarbon methods. In any event, it is probable that the Hickory Creek Terrace morphogenesis progressed for as much as 30-40,000 years, and abandonment of the Hickory Creek floodplain probably occurred ca. 30-40 ka.

Denton Creek Terraces

Below the Hickory Creek Terrace are a series of discontinuous surfaces that are between 10-50 feet above the flood plain. Despite mapping by Taggart (1953), these surfaces are difficult to trace downstream. Matched benches are rarely observed, and sloping surfaces are characteristic (Ferring 1986c). Some of these surfaces mapped by Taggart as Union Terminal or Carrollton terraces are clearly toe slopes of the Hickory Creek Terrace. In some places these surfaces appear to be cut terraces on the lower part of the alluvial fill of

the Hickory Creek Terrace; in others, a fill terrace is documented by borehole data (Ferring, 1986c). Investigation of "Carrollton" terraces in northern Dallas County revealed late Holocene alluvium overlying truncated older alluvium that is probably late Pleistocene. Substantial discharge from Denton Creek complicates reconstructing depositional histories in this part of the valley, and more work needs to be done on the broad, low surfaces that Taggart (1953) mapped as the "Carrollton Terrace". In the Lewisville Lake area, Denton Creek terraces are discontinuously present along the Elm Fork Trinity, but are quite continuous along Little Elm Creek. In both cases they have been eroded and often slope toward the valley axis.

The fill of the Denton Creek terraces (Carrollton alluvium) is always sandy to loamy. As a result, the terrace surfaces are quite dissected; eroded, sloping surfaces are common.

Carrollton Alluvium (late Pleistocene). This alluvial unit was defined as the fill of the Denton Creek terraces (Ferring 1990b, 1993). The lower boundary of the unit is a bedrock bench that may be above or below the elevation of the present flood plain. The upper boundary is either a) the surface of a Denton Creek terrace, or b) clayey recent alluvium where the upper surface (either a buried soil or a truncated section of alluvium) of the Carrollton alluvium is below the present flood plain. In the sections that are bounded by terrace surfaces above the flood plains, the Carrollton alluvium is almost always sandy to loamy. It is usually non-calcareous. In the buried sections it is either sandy or has gravel and sand overlain by fining upward loamy alluvium that is sometimes but not usually calcareous. Moderately developed soils occur at the top of the alluvium unless the section has been truncated by erosion. At localities near Dallas, the Carrollton alluvium contains vertebrate and invertebrate megafossils of Pleistocene age (Willimon 1972), but paleontologic data from this alluvial unit are scarce.

The maximum age of the Carrollton alluvium can be fixed only as roughly as the minimum age of the Coppell Alluvium. Willimon's (1972) radiocarbon ages on the geomorphically lowest Carrollton alluvium appear consistent and reasonable. The late Rancholabrean fauna from Willimon's localities, including Bison antiquus, is consistent with his radiocarbon ages. The vertebrate and invertebrate faunas from Willimon's Carrollton alluvium are indicative of cooler and moister climates than those of the earlier Coppell Alluvium. He proposed that there were diminished seasonal temperature extremes compared to today's climate, and also greater stream discharge.

The last phase of valley incision into bedrock is bracketed by radiocarbon ages between ca. 21 ka and ca. 15 ka. As postulated earlier (Ferring 1986c), this maximum valley entrenchment coincides with the last glacial maximum. Because this was a non-glaciated region, and because of the considerable distance to the Gulf of Mexico, climatic factors are probably the explanation for this incision. Tectonic or eustatic controls cannot be dismissed, but there is no evidence as yet that they were causal factors in this profound geomorphic change. Considering that a very long phase of upstream flood plain growth and downstream valley widening and aggradation (ie. the Hickory Creek morphogenesis) preceded this phase of incision, geomorphic instability must have contributed to the magnitude of the response to a presumed change in climate.

Floodplain

As was described by early explorers of this region, the floodplains of the Trinity and its larger tributaries are broad and exceptionally flat. Depositional geomorphic features such as oxbows or abandoned reaches of meanderbelts are uncommon. Low alluvial ridges and low silty levees occur along the present channels of the Elm Fork Trinity and West Fork Trinity.

The channels of the Trinity are narrow and deep. North of Denton, channels average 7-8 m in depth and are usually between 10-15 m wide. Below Dallas, channels are narrow and approximately 11 m deep. Near Fort Worth, on the West Fork Trinity River, channels are approximately 9 m deep and very narrow. Radiocarbon ages from a number of localities (eg. 41CO141) indicate that during the Late Holocene, channels were about as deep as they are today.

Because of associated archaeological materials, a number of sections of sediments below the floodplain were described and studied at Ray Roberts Lake. Especially important in this regard is the Aubrey Clovis Site (Ferring 1990c, 1995a). Although this site will be described in a separate report, geologic and paleoenvironmental data will be briefly described in this report to better establish the contexts of other Holocene localities at Ray Roberts Lake. The following discussion of late Pleistocene and Holocene alluvial units refers to several that have type sections at the Aubrey Site (Figure 2.8).

Aubrey Alluvium (terminal Pleistocene). This alluvial unit is defined as gravel and sand with occasional beds of finer alluvium, marls or lacustrine sediment, that occur below floodplains (Ferring 1993). The lower boundary of the unit is the deepest bedrock surface below the floodplain. The upper boundary is the contact with the Sanger Alluvium. This boundary is marked by an erosional disconformity with a marked textural change to finer overlying alluvium, and a weakly developed soil. The Aubrey Alluvium is 6-8m thick.

Between ca. 14 ka and 11 ka there was apparently no significant geomorphic change in the Trinity River Valley. This conclusion is made on the basis of data from the Aubrey Clovis Site, which is an admittedly singular but nonetheless strong basis for the conclusion. The spring pool at the site filled with marl and peat between ca. 14-11 ka. The pond was at the level of the flood plain during this interval, yet only trivial alluvium was deposited, and no erosional disconformity is present. A steep slope remained stable above the pond during this interval, and only just before 11 ka is there evidence for colluvial deposition in the pond depression. Immediately after 11 ka, rapid alluviation began the Holocene phase of valley filling. Borehole data preclude the possibility that continued channel entrenchment into bedrock took place between 15-11 ka.

Although spring activity was essentially continuous during this interval, the recharge area for the springs in this area is large, and supported numerous artesian springs and wells up until this century (Hill 1901; Shuler 1918). Spring activity, and therefore aquifer recharge are assumed to have been diminished. Reduced seasonality, the lack of convectional storms (associated with disrupted airmass circulation) and/or equitable distribution of rainfall could account for the lack of flooding, but probably not the low spring discharge. At present, therefore, geologic data suggest an interval of dry if not arid climate. Biotic data from the Aubrey site will soon be synthesized to more firmly assess local terminal Pleistocene environments.

Sanger alluvium (Early Holocene: 11-7.5 ka). Relatively rapid valley alluviation took place in the early Holocene, as shown by radiocarbon ages and soils data from the Sanger alluvium (Figure 2.8). Data from the Aubrey site show that this alluviation began very soon after Clovis occupations, ca. 11 ka, and continued until ca. 7.5 ka. Early Holocene channel facies were dated at the Gateway locality near Fort Worth (Ferring 1986c, 1993), and at several localities along the West Fork Trinity. Sanger Alluvium is exposed below Pilot Point Alluvium.

The Sanger Alluvium is defined as an alluvial unit stratified below the floodplains of the Elm Fork Trinity and West Fork Trinity, and below the floodplain of at least one tributary to the West Fork Trinity (Ferring 1988a, 1993). The lower boundary of the Sanger Alluvium is the contact with the Aubrey Alluvium. The upper boundary is a buried soil and the overlying Pilot Point alluvium. At the Aubrey Site (Ferring 1989, 1990c), along Village Creek (Ferring 1988a; Caran 1990a,b) and at the Gateway locality near Fort Worth (Ferring 1986c) a moderately developed soil occurs at the top of the unit. The same stratigraphy was described at other sites in Ray Roberts Lake at 41CO150, 41CO144 and 41CO141. At the Aubrey Site this unit is dominated by calcareous clays and silts. Sand and/or gravel are revealed in some channel cutbanks and in borehole logs, but overall the dominant lithology appears to be fine grained calcareous alluvium.

The abrupt shift to valley alluviation is presumed to have been caused by an increase in annual precipitation and/or an increase in convectional storm activity. Moist early Holocene climates are documented by a) lacustrine deposits on the High Plains (Holliday 1985; Holliday and Allen 1987; Haynes 1975), b) pollen data from Ferndale Bog in southeastern Oklahoma (Bryant and Holloway 1985) invertebrate faunas from Lake Theo (Neck 1987) and vertebrate faunas from a number of Southern Plains localities (Johnson 1986; Graham 1987; Graham and Mead 1987). In the Upper Trinity River Basin, the disconformity between the Aubrey and

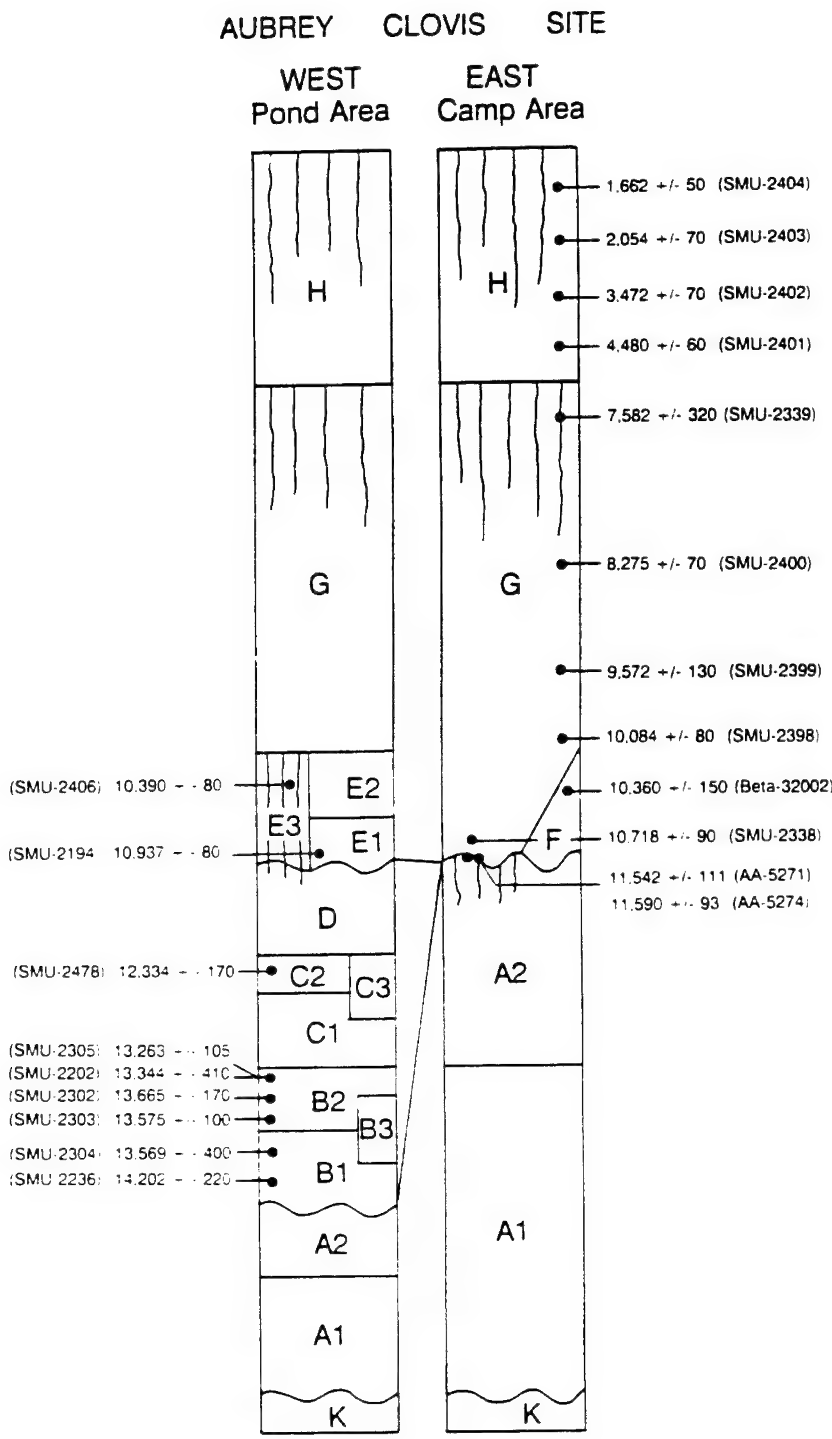


Figure 2.8 Stratigraphic columns and radiocarbon ages from the Aubrey Clovis Site.

by a) lacustrine deposits on the High Plains (Holliday 1985; Holliday and Allen 1987; Haynes 1975), b) pollen data from Ferndale Bog in southeastern Oklahoma (Bryant and Holloway 1985) invertebrate faunas from Lake Theo (Neck 1987) and vertebrate faunas from a number of Southern Plains localities (Johnson 1986; Graham

1987; Graham and Mead 1987). In the Upper Trinity River Basin, the disconformity between the Aubrey and Sanger alluvial units is a stratigraphic boundary for the Pleistocene-Holocene boundary that was climatically controlled. A soil formed in the upper part of the Sanger alluvium during the middle Holocene. At Aubrey this period of floodplain stability/ slow aggradation lasted for ca. 2,500-3,000 years. The middle Holocene soil appears to have formed under drier climates than today, with little alluvium being delivered to floodplains.

Pilot Point Alluvium (Late Holocene: 4.5 ka-present).
The Pilot Point Alluvium occurs at and below the floodplains of the larger streams in the Upper Trinity River Drainage Basin. The lower boundary of the unit is defined by geomorphic setting, and is either a) the contact with the underlying Sanger Alluvium where floodbasin facies are superposed, b) truncated Carrollton Alluvium, or c) an erosional contact with Sanger/Aubrey or older alluvium along present meanderbelts. Away from present meanderbelts, the upper boundary of the Pilot Point Alluvium is the floodplain surface, where a thick, cumulic soil is present in the Pilot Point Alluvium. Along present meaderbelts, the Pilot Point Alluvium includes point bar, oxbow, other channel fill and some vertical accretion (floodbasin) facies; in these settings, the upper boundary of the Pilot point Alluvium is the contact with overlying recent alluvium. Also, along present meanderbelts a thin cumulic or pachic soil, the "West Fork soil" has formed in the upper part of the inset Pilot Point Alluvium (Ferring 1986c; 1993).

Recent alluvium. Recent alluvium, 1-1.5m thick, buries the Pilot Point alluvium along modern channels, and is also present as fill of recently abandoned channels. Recent alluvium thins laterally away from modern channels. This alluvium is more extensive over the Pilot Point Alluvium at the upper end of Lewisville Lake, as a consequence of reservoir construction and a locally elevated base level. Along the West Fork Trinity River, between Dallas and Fort Worth, recent alluvium is also extensive upstream from bedrock controlled valley constrictions.

Late Quaternary Paleoenvironments

In order to interpret the archaeological records from Ray Roberts, a paleoenvironmental history based on different kinds of independent evidence is essential. Climatic and environmental change in the north Texas region is reviewed using several kinds of data from a variety of study locales (Figure 2.9). This review serves as a framework for evaluating local evidence of environmental change that may have been significant with respect to prehistoric adaptations to the Ray Roberts area.

Regional Paleoenvironmental Records

Pollen

There are no pollen records from the upper Trinity River basin, but a few dated pollen spectra are available from peripheral settings (Bryant and Holloway 1985). Older claims that the full glacial vegetation of the Southern Plains was boreal in character have been seriously challenged. First, Holliday (1987) used pedogenic data from the High Plains (Llano Estacado) to show that podsolization (essential evidence for forested vegetation) was not part of the late Quaternary soils record there. Hall's (1992b) analysis of full glacial (ca. 19-17 ka old) pollen from the High Plains showed that a grassland not unlike the flora of today existed in that interval. Pollen data from the Aubrey Clovis Site (Hall 1991) show grassland vegetation between ca. 14.5-12.0 ka, and similar vegetation is recorded at Domebo, Oklahoma, ca. 11.2 ka (Wilson 1966).

Ferndale Bog, located in the Ouachita Mountains of southeast Oklahoma (Figure 2.9), was cored and studied initially by Albert (1981). The bog was cored again in 1981 by Holloway and Ferring; their deeper core recovered sediments with well-preserved pollen from late Pleistocene to late Holocene (ca. 11.8 to 0.6 ka) (Holloway 1993). These pollen spectra were briefly described by Bryant and Holloway (1985); a more detailed diagram is shown here in Figure 2.10. These pollen data show that significant changes in Holocene vegetation of the western Ouachita Mountains preceded establishment of the modern Oak-Pine-Hickory community.

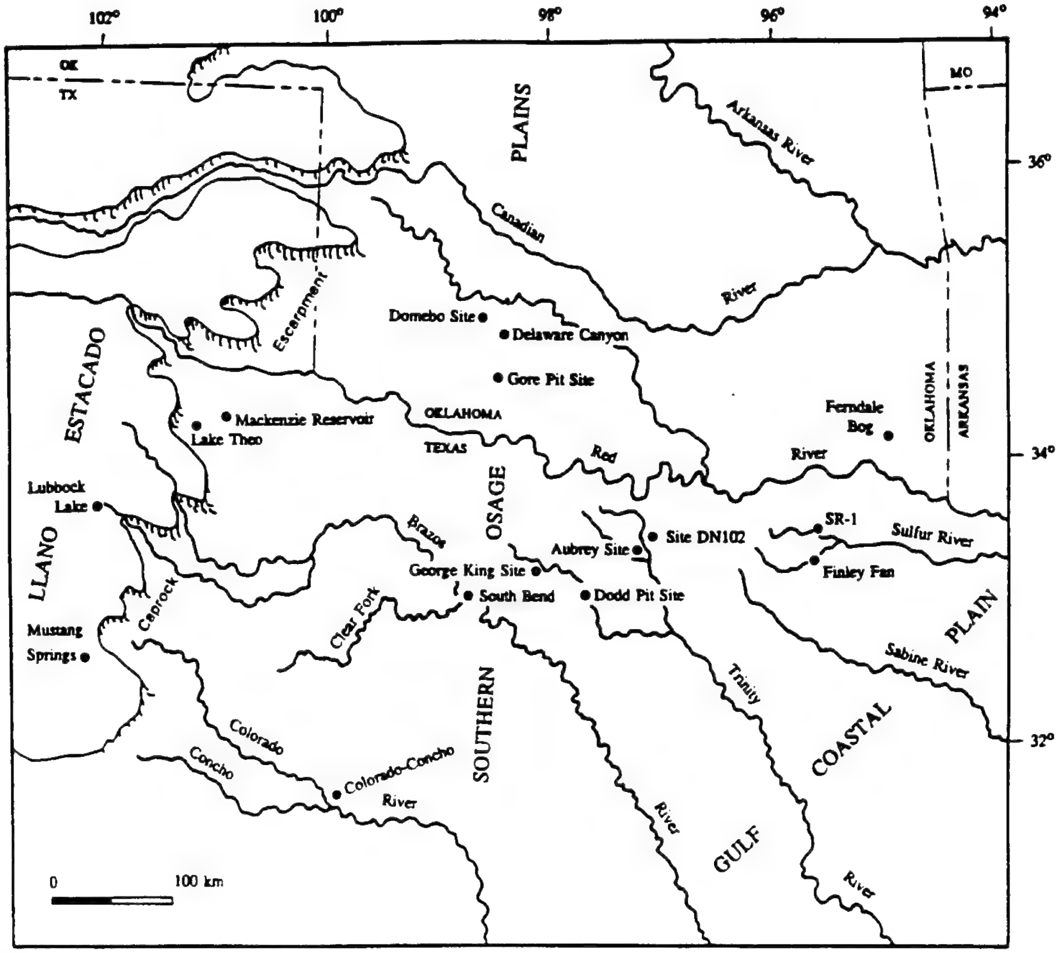


Figure 2.9 Map of the Southern Plains with localities yielding paleoecological data.

The late Pleistocene and early Holocene vegetation was dominated by grass and ambrosia, with moderate frequencies of oak and birch, probably representing sparse upland and riparian arboreal elements respectively. An ambrosia peak at ca. 11 ka is followed by a grass peak ca. 10 ka; declines in these taxa are

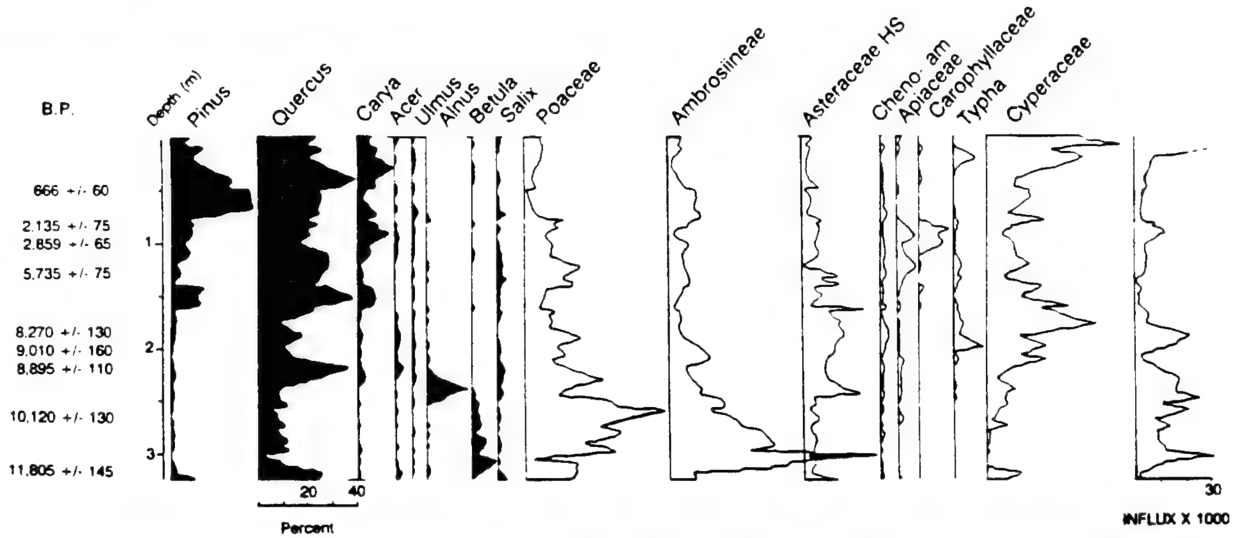


Figure 2.10 Pollen diagram from Ferndale Bog, Oklahoma (data from Holloway 1993).

accompanied by increases in oak and composites. Overall, the early Holocene vegetation is one of an open grassland-artemisia steppe, with a succession to an oak savannah. Early Holocene pollen influx values are very high, suggesting high plant biomass (Figure 2.10). The middle Holocene is a period of continued succession to a mixed oak-pine-hickory forest. Pollen influx values decline markedly in the middle Holocene. This trend is perhaps even more pronounced when the higher overall pollen influx from mixed forests is contrasted with the relatively low influx from prairie communities.

The Ferndale Bog pollen diagram can be divided simplistically into an early Holocene record of a high pollen influx prairie-steppe vegetation and a late Holocene, low pollen influx mixed forest vegetation. In this sense the middle Holocene is a period of compositional transition. In part this pollen record must be viewed as one documenting an ecological succession from the late Pleistocene prairies of the Southern Plains (Wilson 1966; Hall 1992a) to the present forests of southeastern Oklahoma. On the other hand, the very low pollen influx values of the middle Holocene, especially between 6.5-5.5 ka, suggest significant biomass reduction, presumably caused by lower annual precipitation.

A pollen record from Boriack Bog, in central Texas also records vegetation changes during the Holocene (Bryant 1977; Bryant and Holloway 1985). Although not well dated, the pollen data from Boriack document a general reduction in arboreal taxa after ca. 10 ka, accompanied mainly by an increase in grasses. The highest grass frequencies are in samples slightly below a horizon dated ca. 3.8 ka; above that dated horizon, arboreal taxa, mainly oak and small amounts of pine, increase.

Other pollen data from the Southern Plains are almost all from late Holocene sediments, dated younger than ca. 2 ka (Hall, 1988). The pollen data from Ferndale Bog and Boriack Bog suggest that Holocene vegetation reflects successional changes from the late Pleistocene communities, coupled with a general drying trend that appears to have climaxed during the middle Holocene.

Vertebrates

A review of late Pleistocene and Holocene vertebrate faunal data from central Texas by Lundelius (1967) in many ways set the stage for research over the succeeding 25 years. The full glacial faunal assemblages from the Southern Plains are disjunct, with sympatric associations of taxa that today occupy very different ecological settings. This pattern has been further elaborated on in reviews by Graham (1987) and Graham and Mead (1987). The glacial faunas are interpreted as indicating ecological relations different from today, yet their precise meaning is difficult to assess. Markedly reduced extremes of seasonality and wetter full glacial climates are usually inferred from the faunal assemblages. Vertebrates and invertebrate faunas from the 22-20 ka old Carrollton section near Dallas indicate conditions wetter than today, and with significantly greater stream discharge (Willimon 1972). Vertebrate faunal assemblages from the Aubrey Clovis Site are indicative of prairie habitats from ca. 14.5 ka to Clovis time (ca. 11.5 ka), suggesting conditions less forested and probably drier than today. These data offer support to Haynes' (1991) conclusion that climates were dry prior to and perhaps during Clovis occupations.

Lundelius (1967) concluded that the post-Wisconsin faunal record "... is interpreted as showing a gradual drying of the climate and an increase in seasonality. There is no indication of drier conditions during the Altithermal." (Lundelius 1967:316). His observation that middle Holocene faunal assemblages indicate climatic conditions that were moister than those of today was in accord with certain interpretations of Altithermal climates in the Southwest, but is in contrast with many recent views on Altithermal climates in the Southern Plains (Meltzer 1992; Johnson and Holliday 1986).

Based on an analysis of microfaunas from the Wilson-Leonard site in Central Texas, Winkler (1990) has reiterated the interpretation of Lundelius that middle Holocene climates were wetter than today, but did document a trend towards warmer and drier climates beginning about 8 ka. Winkler (1990) concluded that between ca. 9-2 ka fauna from Wilson-Leonard are indicative of conditions moister than today.

Similar conclusions were reached by review of Holocene faunas from the Southern Plains by Graham (1987), who noted that a drying trend began ca. 8 ka. Although Graham stressed that middle Holocene faunas signify climates that were drier than the early Holocene, he contends that they were nonetheless moister than those of today. Graham (1987) also cites evidence from a number of localities indicating a return to moister conditions in the late Holocene, beginning ca. 4 ka. As opposed to a model of progressive aridification throughout the Holocene, Graham suggests climates fluctuated from moist conditions in the early Holocene to a dry middle Holocene interval with a return to moister conditions after that time.

The response of Bison populations to environmental change on the Southern Plains was assessed by Dillehay (1974). He concluded that Bison were rare during the middle Holocene period from ca. 8/7 - 4.5 ka. Another interval with few Bison occurrences was dated to between ca. 1.5 and 0.75/0.65 ka. Bison were relatively common in the remainder of the period Dillehay considered (12-0.4 ka). Lynott (1979) found complimentary evidence in north central Texas archaeological faunas for late Holocene Bison presence ca. 1.5-0.4 ka. His assumption, like that of Hall (1982, 1990) that Bison were prevalent because of dry climates and a local shift to short grasses needs reappraisal.

Dillehay's assessment of middle Holocene Bison occurrence was later strengthened by McDonald (1981), who compiled data on Bison from archaeological and paleontologic localities and showed that Great Plains Bison populations were clearly reduced during the middle Holocene interval. More importantly, these reductions in Bison population were pronounced in the Southern Plains compared to the Northern Plains (Figure 2.11). Archaeological data acquired from this region since the 1981 publication of McDonald tend to support the late Holocene patterns he observed.

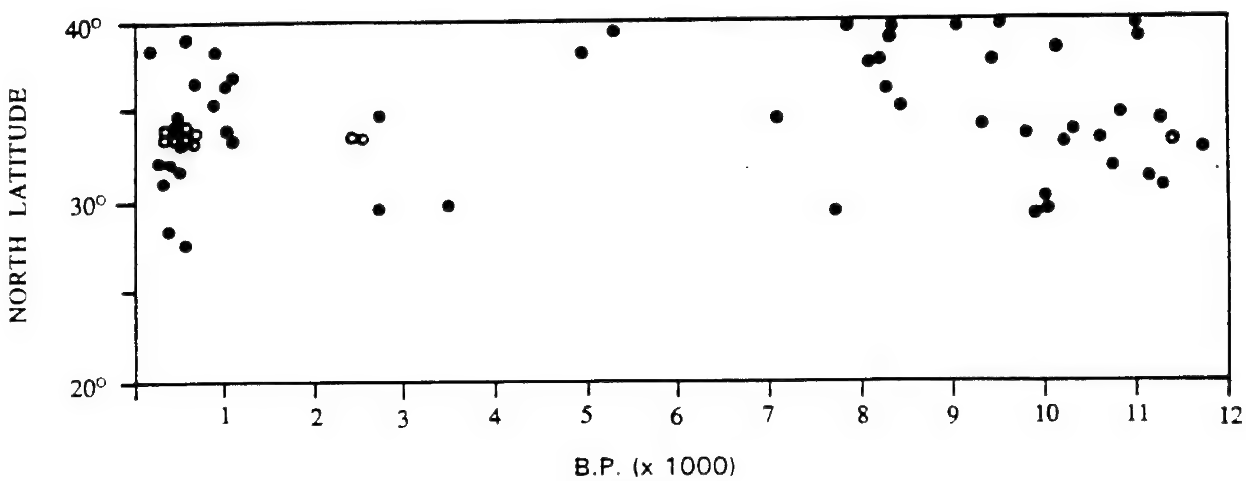


Figure 2.11 Plot of bison presence on the central and southern Great Plains (from McDonald 1981; circles show data from the upper Trinity River Valley).

Bison dental attrition data from the Lubbock Lake site indicate that Southern High Plains Bison populations were stressed but nonetheless present, at least periodically, during middle Holocene time (Johnson and Holliday 1986). There, a number of Bison remains, hearths and artifacts attest to periodic occupations of the Lubbock Lake locality during the middle Holocene.

In sum, many vertebrate data provide evidence of climatic conditions during the full glacial period that were apparently wetter than during the Holocene; the effects of reduced temperatures and diminished seasonality make precipitation estimates difficult. Drier conditions are suggested for the terminal Pleistocene. The Holocene record indicates moist climates during the early and late Holocene, interrupted by a dry middle Holocene (Altithermal) interval, although comparisons of Holocene climates with modern climates is difficult.

As proposed by Ferring (1993, 1995b), bison abundance is this region is probably proportionate to annual precipitation associated with higher prairie biomass in the entire Southern Plains as concluded by Dillehay (1974). Thus overall human occupation potentials should have been better during periods with increased precipitation and more common bison as well.

Mollusks

Fullington and Fullington (1982) compared molluscan faunas from three localities in southwestern Oklahoma (Figure 2.9); these include the Clovis-age fauna from the Domebo Site (Cheatum and Allen 1966), the middle Holocene (ca. 6 ka) fauna from the Gore Pit Site (Cheatum 1974) and their own analysis of late Holocene (ca. 2.0-0.4 ka) faunas from Delaware Canyon (Ferring 1986b). These faunas showed a clear reduction in species diversity through the Holocene. The Domebo fauna, from pond sediments, had 31 species, compared to only 15 species from the Gore Pit Site, which was in an alluvial setting. The late Holocene faunas are more diverse (perhaps owing in part to thorough recovery techniques), yet the modern fauna includes only 12 taxa.

Neck (1987) analyzed a series of molluscan faunas from the Lake Theo site, located at the base of the caprock escarpment of the Llano Estacado and at the western margin of the Rolling Plains (Figure 2.9). The faunas date from late Pleistocene to late Holocene (ca. 12.0- 0.95 ka). Following the moist early Holocene, there was progressive extirpation of taxa, beginning with loss of northern species and followed by loss of eastern mesic species. By ca. 5.5 ka the faunas were essentially modern in composition, although further extirpations were documented. Neck notes that decreases in precipitation and increased seasonality were probably the most important factors associated with these changes in snail faunas.

Stable Isotopes

Haas and others (1986) employed analysis of carbon isotopes to assist in environmental reconstruction at the Lubbock Lake locality. Although their samples derived from both marsh sediments and buried soil A horizons, samples dated between ca. 10.0-0.4 ka show a significant shift towards isotopically enriched compositions that persisted between ca. 8 ka and 5.2 ka. These data suggested vegetational shifts towards C4 taxa associated with drying climates (see also Holliday 1989). This study was followed by carbon isotope study of sediments from Mustang Springs, situated at the southern margin of the Llano Estacado (Meltzer 1991). There, a roughly similar record of isotopic change was obtained; the early Holocene samples are isotopically depleted, indicative of lacustrine sediments and apparently wetter climate. About 8-7 ka there is a marked shift to compositions enriched in ^{13}C, indicative of a shift to higher C4 plant biomass.

Humphrey and Ferring (1994) studied a series of 58 lacustrine, spring and pedogenic carbonate samples from the Aubrey Clovis site (Figure 2.12). The $\delta^{13}C$ of pedogenic carbonates is ca. 8-12 ‰ less than that of associated organics, but the trends in carbonate carbon isotopic composition can be used to infer plant biomass (Cerling 1984; Quade et al. 1989; Margaritz et al. 1981). At Aubrey the early Holocene samples are depleted in ^{13}C. During the middle Holocene, ca. 8-4 ka, there is a clear enrichment in ^{13}C, followed by a return to lighter compositions in the late Holocene. This floodplain record shows a clear decrease in C3 plant composition during the middle Holocene.

The oxygen isotope data from Aubrey are the first isotopic evidence for Holocene temperature fluctuations on the Southern Plains (Figure 2.12). These show a clear episode with depleted isotopes in the latest Pleistocene, indicating colder temperatures; alternatively this trend could signify an influx of depleted meltwaters to the Gulf of Mexico. Nonetheless, this is followed by a rapid warming trend into the Holocene. Importantly, no evidence for warmer temperatures is indicated for the middle Holocene. Rather, average annual temperatures appear to have remained quite stable following minor fluctuations in the early Holocene.

Stable isotopes support an interpretation of colder late Pleistocene climates, followed by essentially modern temperature regimes during all of the Holocene. Carbon isotope trends indicate dry terminal Pleistocene compositions. The Holocene record is one of wetter conditions in the early Holocene followed by

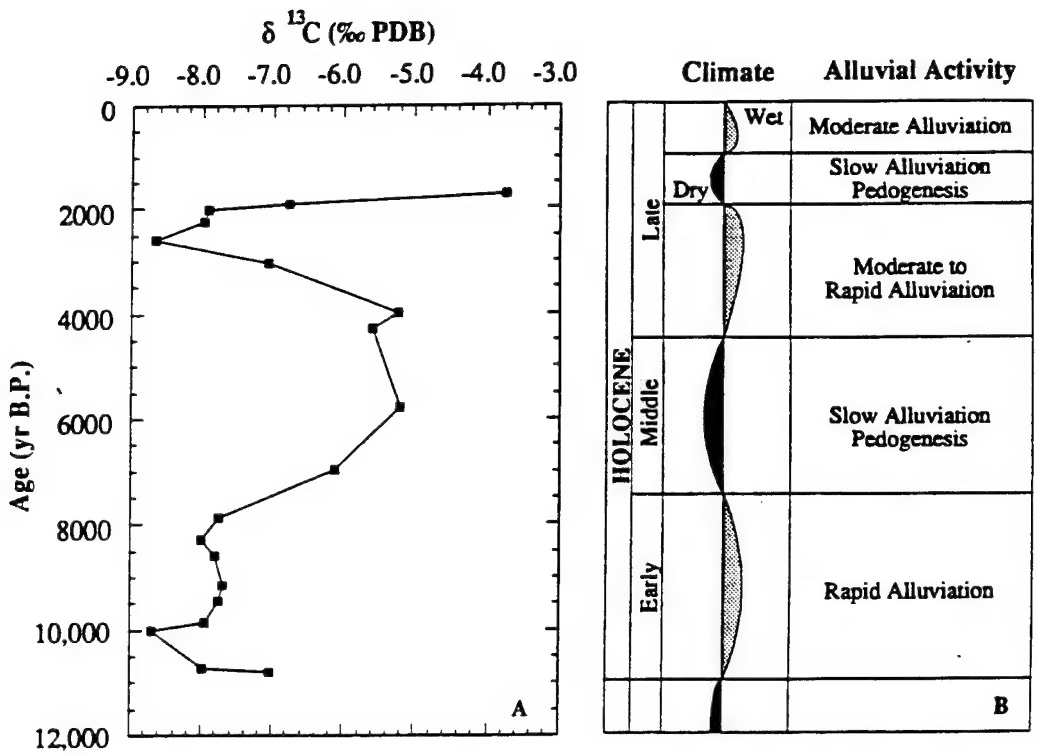


Figure 2.12 Carbon isotopes from the Aubrey Clovis Site (From Humphrey and Ferring 1993).

a marked shift to drier climates in the middle Holocene. The late Holocene appears to have been moist, but with a dry period about 2.0-1.2 ka.

Summary: Late Quaternary Climates

The different kinds of data reviewed suggest the following general patterns of Late Quaternary climate change in the upper Trinity River basin (Figure 2.13). The paleoclimatic record for the region has complex implications for geoarchaeological investigations. A primary effect is that of potential changes in resource availabilities that could have conditioned cultural adaptations to the region. A secondary effect is on patterns of erosion, sedimentation and pedogenesis; these factors condition the geologic conditions pertinent to site formation, including burial, weathering and preservation of archaeological records.

Full glacial climates were cooler than today, and possibly wetter, although pollen data during and after the glacial maximum indicate prairies covered the entire region. Given that lower temperatures would have increased effective precipitation, the vegetation record suggests that rainfall was clearly not greater than today-at least not high enough to promote expansion of the range of forests seen today. The prairie-forest ecotone was still significantly east of today's position ca. 12 ka, and appears to have moved westward during the early Holocene. At the same time, the available pollen and faunal data do not suggest either that the climates were significantly drier than today. These seeming constraints on the magnitude of climate change in this region during the glacial maximum are critical for assessing patterns of alluvial morphogenesis.

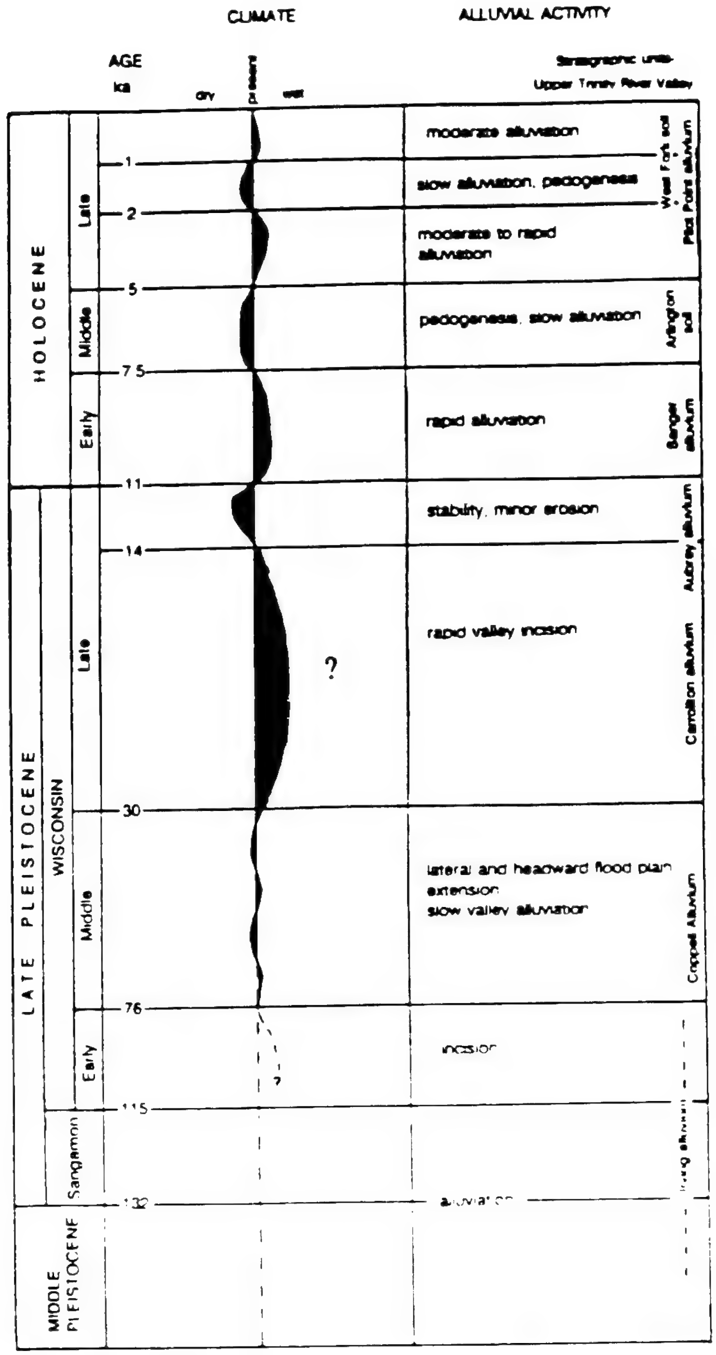


Figure 2.13 Late Quaternary climatic reconstruction and alluvial history for north central Texas and the upper Trinity River Valley (from Ferring 1993)

Post-glacial climates were clearly dry, until about 11 ka. This is supported by faunal and pollen data, especially from the Aubrey Site. The early Holocene was a period of greater precipitation. This interval was probably wetter than today, based on faunal, pollen and isotopic evidence. It was also a period when increased seasonality returned to this region. Extinction of Pleistocene megafauna was finished by earliest Holocene and dispersal of disjunct taxa was basically completed during this interval.

Middle Holocene climates were drier than the early Holocene. Isotopic data from Aubrey suggest they were not warmer, but an increase in seasonality may have occurred. Microfaunal data suggest that although drier than the early Holocene, conditions may have been somewhat moister than today; this conclusion has not been reached using other kinds of data.

About 4 ka moister climates are well documented. These persisted in the late Holocene until about 2 ka, when a dry period began, lasting until about 1.2 ka. Another moist-dry cycle of moderate amplitude ensued. Thus, the late Holocene was a period of fluctuating climates that were, on average, wetter than the middle Holocene.

CHAPTER 3: ARCHAEOLOGICAL BACKGROUND

Previous Investigations

Prikryl (1987) provides a summary of previous investigations in northcentral Texas with emphasis on the lower reaches of the Elm Fork of the Trinity River. The following is a summary of previous archaeological investigations located within or near the Lewisville Lake project area. The earliest reported archaeological investigations near the project area were in the 1930's (Harris 1936, 1939, 1940). In the early 1940's several reports of investigations along the Elm Fork of the Trinity River were published (Conger 1940, Harris 1940, 1949c; Harris and Hatzenbuehler 1949).

Krieger's Culture Complexes and Chronology in Northern Texas (1946) describes archaeological remains in surrounding regions but none from the Lewisville Lake project area (Prikryl 1987:48). The earliest professional archaeological investigations in the project area were conducted by the Smithsonian Institution River Basin Surveys (RBS). After the field survey, Stephenson (1949) reported 27 prehistoric sites in the Lewisville Lake (formerly called Lake Dallas and Garza-Little Elm Reservoir) project area (Prikryl 1987:49-50). At least three sites (41DN5, 41DN6, and 41DN12) were subsequently tested but Stephenson never published results of these investigations (Prikryl 1987:51).

After the Smithsonian Institution River Basin Surveys (RBS) were completed, Harris published several reports on his collections from several sites in the Lewisville Lake area. Among the more important sites Harris describes are 41DN353 (Harris 1950:21-22), 41DN28 (Harris 1951a), and 41DN6 (Harris 1951b). The Lake Dallas Site (41DN6) and the Wheeler Site are the two type localities described by Crook and Harris (1952) in their definition of the Carrollton Focus of the Trinity Aspect. Their description of the Carrollton Focus included the fact that only lithic remains were known from the sites. Most lithic tools consisted of dart points and characteristic gouges. Projectile points include styles similar to "Plainview-like, unfluted-Folsom, or other early types" (Crook and Harris 1952:17). The majority of the scrapers are similar to Clear Fork Gouges. Another characteristic stone artifact associated with the Carrollton Focus is the Waco Net Sinker. Site 41DN6 has subsequently been inundated by Lewisville Lake.

At site 41DN353 Harris (1950) reported several small circles of burned stones. The stone circles measured approximately 3 to 4 meters in diameter. Near the center of the stone circles was evidence of fire and many burned rocks. Harris (1950) believed the stone circles resembled remains of prehistoric structures. Harris (1950) also reported three obsidian artifacts from the site.

One of the most controversial sites reported on was the Lewisville Site, 41DN72. The Lewisville site was reported by White in 1952 during a paleontological survey of the lake. Excavations at the site by the Dallas Archaeological Society resulted in recovery of a Clovis projectile point, and late Pleistocene fauna in probable association with only a few stone artifacts of human manufacture associated with 21 burned features. Radiocarbon dates derived from the features yielded dates greater than 37,000 years BP (Crook and Harris 1957, 1968). Because of the extreme radiocarbon dates for Clovis, a controversy arose as the whether the features were of human design (Heizer and Brooks 1965). The site became inundated before the controversy was resolved.

Additional work was conducted at the Lewisville site in 1979 and 1980 during a severe drought that lowered the lake level enough to expose the site for excavation. The Smithsonian Institution conducted the investigations. Charred material submitted for radiocarbon dating was determined to be lignite coal rather than charcoal. It yielded a date similar to the previous dates from the site (Stanford 1982). Results of investigations at the site by the Smithsonian Institution in 1979 and 1980 have not been published (Prikryl 1987:58).

During the 1960s, reports on two sites at Lewisville Lake were published. These were the Irish Farm Site (41DN62) (Barber 1966) and the Hackberry Site (41DN57) (Barber 1969). The storage pits and associated

artifacts excavated at the Hackberry Site are typical of the Henrietta Focus (Prikryl 1987:62).

During the 1970s several surveys were conducted within the Lewisville Lake and nearby Ray Roberts Lake project areas. An archaeological survey of portions of Ray Roberts Lake (formerly Aubrey Reservoir) was conducted by SMU in 1972 (Bousman and Verrett 1973). A total of 26 sites were recorded and examined during their investigation. An archaeological survey of portions of the Lewisville Lake shoreline was conducted in 1973 by the Richland Archaeological Society (Nunley 1973). Nunley (1973) described 50 sites that are located on or near the shoreline. An archaeological survey and site testing program was conducted at a planned industrial park below Lewisville Lake dam during the summer of 1974 which resulted in the recording of 11 sites and test excavations at one (McCormick, Filson, and Darden 1975).

All archaeological investigations conducted during the 1980s at Ray Roberts Lake were by Environmental Consultants Inc. [ECI] (Skinner et al. 1982a, 1982b; Skinner and Baird 1985) and the University of North Texas [UNT] (Brown et al. 1990; Lebo 1990; Prikryl and Yates 1987). ECI surveyed approximately 30 sq km in 1980 which resulted in the recording of 43 previously unrecorded prehistoric sites (Skinner 1982b:1.1). Results of this survey made a total of 345 sites within the project area of which 114 had prehistoric components (Skinner et al. 1982a:8.2-8.3). In 1980-1981 ECI conducted test excavations at 19 prehistoric sites (Skinner et al. 1982b) with recommendations for further investigations to be conducted at selected sites that were believed to contain significant information about the prehistory of the region. During 1982 six sites, 41DN79, 41DN81, 41DN85, 41DN101, 41DN102, and 41DN103, were selected for further excavation since they had been recommended as being eligible for nomination to the National Register of Historic Places. These sites contained Middle Archaic to Lake Prehistoric remains that were in their primary context (Skinner and Baird 1985). The research by UNT in 1986-1988 at Ray Roberts Lake is the most recent and comprehensive investigations in the project area (Brown et al. 1990; Lebo 1990). In Lewisville Lake, a human burial was found eroding along the shoreline at the Hackberry Site (41DN57) in 1984 (Barber and Lorrain 1984; Yates 1984) and SMU conducted a survey of Wynnewood Park at Lewisville Lake at that time (Cliff and Moir 1985).

The research by UNT in 1986-1990 is the latest archaeological investigation associated with Ray Roberts and Lewisville Lakes. This work included survey, testing, and an excavation program to mitigate adverse impacts upon significant cultural resources by the construction and filling of Ray Roberts Lake and the proposed raising of the Lewisville Lake waterline by seven feet

Table 3.1 Prehistoric Sites at Lewisville Lake

Site	Stream	Geomorph Setting	Elev (ft MSL)	Components	References
41DN1	Pecan C.	terrace	515	LA,LPI,II	1,7,11,22
41DN2	Elm F.	terrace	530	LPII	7,8,9,11, 13,14,22
41DN3	L. Elm C.	terrace	500	EA,LA,LPI,II	7,8,9,11,22
41DN4	L. Elm C.	upland	535	LA,LPI,LPII	7,8,9,11, 13,14,22
41DN5	Elm F.	terrace	500	P,EA,MA,LA,LPI,II	7,8,9,11,22
41DN6	Elm F.	terrace	500	P,EA,MA,LA,LP II	3,4,5,6,7, 8,9,11,22
41DN8	Hick. C.	terrace	530	LA,LPI,II	7,8,9,11,22
41DN9	Elm F.	floodp.	500	U	7,11,22
41DN10	Hick. C.	terrace	500	P,EA,LA,LPI,II	7,11,22

Table 3.1, cont.

41DN11	L. Elm C.	upland	535	P,EA,MA,LA, LPI,II	7,11,13,22
41DN12	L. Elm C.	terrace	560	LA,LPI,II	11,22
41DN20	L. Elm C.	upland	532	MA,LA,LPII	11,13,14,22
41DN21	Run. B.	upland	540	A	11,13,14,22
41DN23	L. Elm C.	upland	535	U	11,13,22
41DN24	L. Elm C.	upland	535	A,LP	11,13,22
41DN25	Hick. C.	terrace	540	LP	11,22
41DN26	L. Elm C.	upland	535	LA,LPII	11,13,14,22
41DN27	L. Elm C.	terrace/ upland	535	LA,LPII	11,13,14,22
41DN28	L. Elm C.	terrace	530	EA,LA,LPI,II	2,11,22
41DN29	L. Elm C.	upland	532	LP	11,13,22
41DN37	L. Elm C.	upland	535	A,LP	11,13,14,22
41DN40	Run. B.	upland	540	EA,LA,LPII	11,13,14,22
41DN41	L. Elm C.	upland	535	U	11,13,22
41DN43/44	Coop. C.	terrace	535	U	11,13,22
41DN47	Elm F.	terrace	555	A	7,11,22
41DN49	Elm F.	terrace	500	EA,MA,LA,LPI,II	7,22
41DN50	Elm F.	terrace	530	LP	8,11,22
41DN51	Elm F.	terrace	510	LA,LPI,II	7,11,22
41DN52	Elm F.	terrace	510	LA,LPI,II	7,11,22
41DN53	Hick. C.	terrace	500	U	8,22
41DN57/62	Hack. C.	upland	530	U	7,10,11,13,22
41DN58/70	Elm F.	terrace	520	LA,LPI,II	7,11,22
41DN59/71	L. Elm C.	terrace	500	EA,LA,LPI,II	7,11,22
41DN60	Elm F.	terrace	500	A	7,11,22
41DN72	Hick. C.	terrace	500	P	15,16,17,18,19,20,21,22
41DN288	Elm F.	upland	518	U	12,13,22
41DN354	Elm F.	upland	520	P,EA,MA,LA,LPI,II	13,22
41DN366	L. Elm C.	terrace	565	U	13
41DN367	L. Elm C.	upland	545	A	13
41DN368	L. Elm C.	floodp.	535	U	13
41DN369	L. Elm C.	floodp.	525	U	13,14
41DN370	L. Elm C.	upland	545	U	13
41DN372	L. Elm C.	upland	532	LA,LPII	13,14
41DN373	L. Elm C.	upland	530	U	13
41DN374	L. Elm C.	upland	530	LA	13,14
41DN375	L. Elm C.	upland	532	U	13
41DN376	L. Elm C.	terrace	532	LP	13
41DN377	L. Elm C.	terrace	525	LA	13,14
41DN378	Run. B.	upland	535	U	13,14
41DN380	Run. B.	upland	540	A	13
41DN381	L. Elm C.	upland	535	LA,LPI,LPII	13,14
41DN382	L. Elm C.	upland	545	A	13
41DN383	L. Elm C.	terrace	530	U	13
41DN384	L. Elm C.	upland	432	LPI	13,14
41DN385	L. Elm C.	upland	535	U	13
41DN386	L. Elm C.	terrace/ upland	535	LA,LPI,LPII	13,14
41DN387	L. Elm C.	upland	535	LPII	13,14
41DN388	L. Elm C.	terrace	520	U	13
41DN389	L. Elm C.	upland	530	LP	13

Table 3.1, cont.

41DN392	L. Elm C.	upland	530	U	13,14
41DN396	L. Elm C.	upland	532	U	13
41DN397	L. Elm C.	terrace	535	U	13
41DN411	L. Elm C.	terrace	525	U	13
41DN412	Elm F.	upland	520	U	13
41DN419	Hick. C.	upland	515	A	13
41DN420	Hick. C.	upland	520	LP	13
41DN427	Hick. C.	terrace	520	U	13
41DN434	Hick. C.	upland	530	U	13
41DN435	Hick. C.	upland	530	U	13
41DN436	Hick. C.	upland	530	U	13,14
41DN437	Hick. C.	upland	520	U	13
41DN441	Hick. C.	upland	520	A,LP	13
41DN442	Hick. C.	terrace	522	LA	13,14
41DN443	Hick. C.	upland	545	A	13
41DN444	Hick. C.	upland	530	U	13
41DN445	Hick. C.	upland	540	U	13
41DN446	Hick. C.	upland	532	LA,LP	13,14
41DN447	Hick. C.	terrace	530	U	13,14
41DN448	Hick. C.	terrace	532	U	13,14
41DN449	Hick. C.	terrace	535	LP	13
41DN454	Elm F.	upland	532	U	13
41DN455	Elm F.	upland	540	U	13
41DN459	Pecan C.	upland	530	A	13
41DN461	Elm F.	terrace	535	U	13
41DN465	L. Elm C.	terrace	550	U	13
41DN473	Hick. C.	upland	535	U	13

key:

drainages
Coop. C.= Cooper Creek L. Elm C. = Little Elm Creek Elm F = Elm Fork of the Trinity River
Pecan C. = Pecan Creek Hack C. = Hackberry Creek Run B = Running Branch
Hick. C = Hickory Creek

Component
P= Paleoindian A = Archaic EA= Early Archaic MA = Middle Archaic
LA= Late Archaic LP = Late Prehistoric LPI = Late Prehistoric I
LPII= Late Prehistoric II U = Undetermined

References
1 (Harris 1940) 2 (Harris 1951a) 3 (Harris 1952b) 4 (Crook and Harris 1952) 5 (Crook and Harris 1953) 6 (Crook and Harris 1954b) 7 (Stephenson 1948b) 8 (Stephenson 1949) 9 (Stephenson 1950)
10 (Barber 1969) 11 (Nunley 1973) 12 (Cliff and Moir 1985) 13 (Lebo and Brown 1990) 14 (Brown and Lebo 1991) 15 (White 1952) 16 (Crook and Harris 1957) 17 (Crook and Harris 1962) 18 (Heizer and Brooks 1965) 19 (Heizer 1974) 20 (Stanford 1981) 21 (Shiley et al. 1985) 22 (Prikryl 1990)

* elevations of 500 ft are estimates for sites inundated by Lewisville Lake.

Culture History

Prikryl (1990) has developed a synthesis of all prehistoric cultures located along the lower Elm Fork of the Trinity River. Ferring and Yates (1997) have developed a synthesis of Late Archaic through the Late Prehistoric cultures for Ray Roberts Lake. Those studies are summarized and modified here because they are the most recent interpretation of the prehistory for the Lewisville Lake area. Because of the absence of Paleoindian components in the current study, Prikryl's (1990) summaries there are not modified. Table 3.1 lists all known prehistoric sites within the Lewisville Lake project domain while Table 3.2 lists the sites excavated by UNT and their probable cultural affiliations based on temporally diagnostic artifacts and radiocarbon dates.

Table 3.2 Excavated Site Blocks and Levels With Assigned Cultural Affiliation

Site	Block / Levels	Components*
41DN20	Block 1 levels 13-25	LP II
	Block 1 levels 26-35	EA/MA
41DN26	Block 1 levels 1-9	LP II
	Block 1 levels 10-15	LA
41DN27	Block 1 levels 1-14	LP II
	Block 3 levels 16-19	LP II
	Block 3 levels 20-23	LA
41DN372	TPs 7,15,16 1-13	Historic
	Block 1 levels 1-7	LP II
	Block 1 levels 8-10	LP I/II
	TP 41 1-13	LA
41DN381	Block 1 levels 12-19	LP II
	Block 1 levels 20-22	LP I/II
	Block 1 levels 23-30	LA

* see Table 3.1

Paleoindian (pre-8,500 BP)

Evidence of Paleoindian occupation in the Lewisville Lake area comes from surface finds of Clovis, Dalton, Plainview, Midland, San Patrice, Golondrina, and Scottsbluff projectile point types (Prikryl 1990:150-152). Excavations conducted at the Aubrey Clovis Site (41DN479), located at Ray Roberts Lake, have yielded large quantities of lithic and faunal remains (Ferring 1989:9-11). Also, the Lewisville Site (41DN72) was excavated in the 1950's and early 1980's (Crook and Harris 1957; Stanford 1982). It is generally believed that a nomadic lifeway based on a generalized hunting and gathering subsistence economy was practiced by the Paleoindians of northcentral Texas (Prikryl 1990:153). Social organization was based on small bands of aggregated families with a high degree of mobility that permitted them to move over large areas. Human population density was low (Lynott 1981:101). The fauna recovered during excavations at the Lewisville site suggests a broad spectrum subsistence pattern that includes a variety of animals. No Paleoindian period components were excavated during the present project.

Early Archaic (8,500-6,000 BP)

Wetter climates appear to have characterized this period. Grasses were probably dominant between 9,000 and 5,000 BP (Prikryl 1990:156). Like the preceding Paleoindian period, peoples assigned to the Early Archaic are believed to have continued with a nomadic lifeway based upon a diffuse subsistence economy with no archaeological evidence of territorial boundaries (Prikryl 1990:160). Human population density continued to be low (Lynott 1981:103). Evidence of Early Archaic period occupations in the Ray Roberts Lake area comes primarily from surface finds of the Angostura and early split stemmed projectile point types (Prikryl 1990:158-161). An Early-Middle Archaic period component was excavated at 41DN20 during the present project.

Middle Archaic (6,000-3,500 BP)

During this period the area probably experienced drier climates and a concomitant reduction in biotic resources (Ferring 1995a). Evidence of Middle Archaic period occupations in the Ray Roberts Lake area comes primarily from surface finds of the Carrollton, Morrill, Wells, and Trinity group of projectile points, and Clear Fork Gouges. The in situ Middle Archaic component at 41DN102 (Ferring and Yates 1996) provides the best regional evidence of assemblage composition and patterns of faunal exploitation. By the end of this period the occurrence of specific diagnostic projectile points may represent the beginnings of regionalization that are hypothesized by Lynott (1977:158). Results of this study indicate the Middle Archaic projectile points are made equally from nonlocal (50%) and local materials (50%). The local material is represented by Ogallala Quartzite.

Previous literature has assigned the Carrollton Focus to the Middle Archaic period (Crook and Harris 1952:38; Lynott 1977:82), but this term is no longer of utility. A nomadic lifeway based upon a diffuse subsistence economy in the prairie and Cross Timbers continued through the Middle Archaic period. There may have been a shift in the human demography of the region as social groups began to intensively exploit bottomland resources (Lynott 1981:104).

Late Archaic (3,500-1,250 BP)

Prior to these investigations most evidence for the presence of Late Archaic occupations in the Lewisville Lake area was based on excavations by UNT at Ray Roberts Lake (Brown et al 1990) and the surface recovery of Gary, Dallas, Godley, Ellis, Elam, Edgewood, and Yarbrough projectile point types. These projectile point types suggest cultural affinities with areas to the north and east (Prikryl 1990:166) as well as to the Southern Plains and central Texas (Brown et al 1990). Results of this project indicate the most characteristic Late Archaic dart/spear points include Fairland, Martindale/Edgewood, Ensor, Darl, Pandale, Kent, Morrill/Kent, Wells, Marshall, Carrollton/Langtry, Motley, Dallas/Langtry, #6 and 8 Gary, Palmillas, and Refugio.

Results of this study indicate projectile points are made primarily from local (64%) quartzite with nonlocal (33%) materials constituting approximately one-third of the assemblages. For the five sites excavated 78% of the debitage assemblages are of local quartzite with the rest being a variety of nonlocal cherts (22%).

The development of the West Fork Paleosol during the later part of the Late Archaic period may reflect a wetter environment (Ferring 1986:112). An expansion of the Eastern Cross Timbers would have provided a larger mast crop for consumption by humans and game animals (Prikryl 1990:170), with emphasis directed toward intensive exploitation of bottomland resources (Lynott 1981:104). The climatic conditions were probably similar to those encountered by the earliest Europeans to visit the area (Lynott 1981:104).

Several Late Archaic components were excavated at Lewisville Lake that encompass part of the Late Archaic period. These components occur at sites 41DN20, 41DN26, 41DN27, 41DN372, and 41DN381. All of the components represent remains of nomadic hunters and gatherers who practiced a broad spectrum subsistence economy within the Eastern Cross Timbers. The most common animals include deer, rabbit, and

turtle. However, even though a diverse osteological assemblage occurs at all of the sites, white-tailed deer would have provided the bulk of the meat diet. Therefore, although subsistence was diffuse, the hunting strategy was most likely focal. The components suggest short term occupations which are probably associated with a seasonal scheduling of harvesting available resources.

Late Prehistoric I (1,250-750 BP)

Major technological advances, i.e., the introduction of ceramics and the bow-and-arrow, occurred during the Late Prehistoric I period. In addition, maize made its first appearance in the area as evidenced at the Cobb Pool site (41DL148) located in Joe Pool Lake, south of the Ray Roberts Lake project area, suggesting it was either being grown or being acquired through trade (Peter and McGregor 1987:9.15). The importance of maize within the prehistoric diet of the period has not been ascertained; however, deer, rabbit, and turtle appear to have been important meat sources (Prikryl 1990:173-177). Although evidence for the use of cultigens occurs in the adjacent areas, no evidence exists for the Lewisville Lake project domain.

The most common occurring arrowpoint types that are probably associated with the Late Prehistoric I occupations include Alba, Catahoula, and Washita. Arrowpoints that commonly occur in both Late Prehistoric I and II contexts include Scallorn and Fresno-like types. Results of this study indicate arrowpoints are made primarily from local (58%) material with a large number also made from nonlocal (42%) material, consisting mostly of cherts. The debitage assemblages consist of mostly local (86%) material.

Late Prehistoric I period ceramics are tempered with grog and bone. Some exhibit decorations similar to those found on Early Caddoan types from East Texas sites (Prikryl 1990:173-174) indicating a movement of Caddoan groups from eastern Texas into the prairie and cross timbers (Lynott 1981:105). This movement of peoples and introduction of new technologies coincides with signs of territorial conflict as evidenced by skeletal remains displaying signs of violent death. Caddoan influence was greatest in the Blackland Prairie with seasonal occupations in the prairie areas of the Sulphur River drainage. The Caddoan presence in the Sulphur River drainage probably had considerable influence on the peoples along the East Fork of the Trinity River and Middle Trinity River (Lynott 1981:105).

Although no Late Prehistoric I component was excavated at Lewisville Lake, two sites, 41DN372 and 41DN381, had transitional Late Prehistoric I/II occupations. These components, as well as those at the nearby Ray Roberts Lake, indicate a nomadic broad spectrum subsistence economy was practiced which was probably part of a seasonal scheduling of subsistence activities. This is supported by the absence and/or paucity of Late Prehistoric I Period ceramics from 41DN372, 41DN381, and sites 41DN79, 41DN81, 41DN197, 41CO141 and 41DN103 at Ray Roberts Lake. The most common occurring animals include deer, rabbit, and turtle, indicating a broad spectrum subsistence economy. However, even though a diverse faunal assemblage is present at all of the sites, white-tailed deer would have provided the bulk of the meat diet. Therefore, a focal hunting economy is proposed for this period. Also, it is during the Late Prehistoric I Period that the northern portion of the Eastern Cross Timbers may have been used as a "buffer zone" (Hickerson 1965:60) by the more specialized societies in east Texas, central Texas, and the Southern Plains (Brown et al. 1990).

Late Prehistoric II (750-250 BP)

A change to moister climates at approximately 1,000-800 BP is believed to have ushered in the Late Prehistoric II Period. The presence of bison remains at archaeological sites in the region following their absence in earlier periods is thought to be additional evidence for a moister climate (MacDonald 1981; Ferring 1990, 1995a). The recovery of a bison tibia digging stick and two bison scapula hoes from site 41DN57 at Lewisville Lake suggested a subsistence economy based partially on horticulture (Barber 1969).

Results of previous investigations indicate the most characteristic arrowpoints are Washita, Perdiz, and Toyah. Arrowpoints that frequently occur in both Late Prehistoric I and II contexts include Scallorn, Bonham-Alba and Fresno types.

Results of this study indicate slightly greater than one-half of the arrowpoints are made from local (53%) material while nonlocal (47%) materials, consisting mostly of cherts, constitute a little less than one-half of the assemblages. The debitage assemblages are characterized by mostly local (77%) material.

The adaptive changes in northcentral Texas during the Late Prehistoric II period are believed to be the result of human population increase and increasing influence of the east Texas Caddoan and western nomadic bison hunting peoples. The changes do not include any new form of adaptation but rather homeostatic change to environmental and cultural factors. The return of bison to the region, as evidenced by large quantities of bison faunal elements from many of the Late Prehistoric II Period sites excavated at Lewisville Lake, suggests they were taken as a result of opportunistic hunting rather than as a concerted effort. The absence of semi-sedentary or sedentary horticultural villages indicates temporary use of the northern portion of the Eastern Cross Timbers throughout the Lake Prehistoric period.

Several Late Prehistoric II components were excavated in the Lewisville Lake project domain. These components occur at sites 41DN20, 41DN26, 41DN27, 41DN372, and 41DN381. The components represent remains of a nomadic broad spectrum subsistence economy that included bison, deer, rabbit, and turtle as the most common animal foods. However, even though a diverse faunal assemblage occurs at all of the sites, bison and white-tailed deer would have provided the bulk of the meat diet. It is postulated that the northern portion of the Eastern Cross Timbers may have been used as a "buffer zone" (Hickerson 1965:60) between more specialized societies in east Texas, central Texas, and the Southern Plains (Brown et al. 1990).

These components are most likely associated with a scheduling of seasonal rounds based on the small quantities of ceramics from these sites. The ceramic assemblage from each site probably represent only two or three vessels. One of the pottery types of the Late Prehistoric II Period is Nocona Plain which is a shell tempered ware with plain interiors and exteriors. Prikryl (1987:179) indicates much of the pottery Stephenson (1949) described as Nocona Plain is actually tempered with bone, fossil shell, and crushed limestone.

Proto-Historic (250-100 BP)

No Historic Indian Period sites are reported within the Lewisville Lake or Ray Roberts Lake project areas (Brown et al. 1990; Prikryl 1990:182). No known sites contain a cultural inventory that represents the shift from locally manufactured materials to those indicative of Indian/Euro-american trade. The Historic Indian Period is, therefore, a major gap in the archaeological record for the Lewisville Lake area as elsewhere in the state.

One site at Ray Roberts Lake, 41DN79, does contain a potential Proto-Historic or early Historic occupation based on recovery of gunflints and a piece of French faience pottery by ECI (Skinner and Baird 1985) and excavation of Feature 18 by UNT which yielded large quantities of nineteenth century historic artifacts associated with several prehistoric items of chipped stone (Brown et al. 1990). This site has the greatest potential of having a Proto-Historic or early Historic component (see Lebo 1990)

Conclusions

Based on the excavations of stratified cultural deposits at five sites spanning possibly the past 5,000 years, there appears to have been a major shift in territorial size and/or trade networks at the end of the Middle Archaic and the beginning of the Late Archaic periods. This evidence is in the form of a shift in emphasis on locally available raw materials for the manufacture of projectile points. The introduction of ceramics and bow-and-arrow at the beginning of the Late Prehistoric I period appears not to have had any major changes in settlement patterns, subsistence economy, or social organization. The subsistence economy appears to be broad spectrum from Late Archaic through Late Prehistoric II with the primary game animal being the white-tailed deer.

The northern portion of the Eastern Cross Timbers, with is proximity to the Red River Valley immediately to the north, provided an expansive ecotone provided ideal habitat for supporting large populations

of diverse faunal and floral communities unavailable in either of the other habitats. Consequently, with the Red River as a major transportation and communication route between the peoples in the eastern woodlands and western prairies, the northern portion of the Eastern Cross Timbers are believed to have functioned as a buffer zone as described by Hickerson (1965:60) as a common occurrence among historic American Indian societies.

The Eastern Cross Timbers, being used as a buffer zone, would have provided a large resource area for white-tailed deer and mast crop. The intra-component variation observed within individual assemblages is believed to represent seasonality of site use and homeostatic change rather than cultural evolutionary change. This is supported by the absence of recognizable semi-sedentary or sedentary villages, paucity and absence of ceramics from Late Prehistoric components, and continual broad spectrum subsistence economy from the Late Archaic through Late Prehistoric II periods.

CHAPTER 4: RESEARCH DESIGN AND METHODS

Research Rationale

An overview of the research design is presented here that has structured the archaeological investigations at Lewisville Lake. Our overall perspectives pertained to both prehistoric and historic investigations, since these are concerned with cultural ecology and culture history; these are domains of anthropology that are not bounded by spatial, temporal, or empirical limits. Subsequent to developing these general perspectives, however, prehistoric and historic aspects of the project are considered separately. At the specific level of research hypotheses, data requirements, and research methods, it is appropriate to discuss these two major components of the research separately. We note, however, that our research design includes general theoretical and methodological convergence with respect to prehistoric and historical issues. As shown in the following discussions, our focus on landscape evolution, social and economic patterning, and culture change provides fertile ground for diverse yet complimentary investigations into the character of occupations throughout the prehistoric and historic periods.

General Issues

Implicit in cultural resources projects such as Lewisville Lake is the opportunity to investigate a record of human cultural dynamics within a defined region, ranging from the initial occupations to the present. Such investigations must be conducted from chosen theoretical perspectives and with chosen strategies of data collection and analysis. The fact that these are parts of a broader attempt to mitigate known and potential impacts associated with Federal land use, i.e., that these investigations are integral to cultural resource management (CRM), is not an incidental issue. We approached both tasks set out in the scope of work and the specific cultural resources sites as part of a strategy to offset unavoidable loss of cultural resources and to minimize future losses or impacts. For practical purposes, we assumed that many of the sites investigated will either be destroyed or will be inaccessible for archaeological study for many decades to come. Under these circumstances, which are common to CRM investigations, we suggest that the chosen theoretical issues and the chosen research strategies should exhibit full concern for the state of archaeological and historical knowledge in the region and for the discipline. Our commitment in this respect was to maximize consideration of recognized deficiencies in knowledge concerning cultural history and cultural process in this region, to maximize use of methods and techniques that have been shown effective in addressing those deficiencies, and to exploit, wherever possible, methods enhancing comparability of our research with that conducted by other institutions and other agencies in this region. We will clearly define the difference between standard research methods and those that are innovative or experimental.

The Lewisville Lake area is an ideal setting for conducting archaeological and historical research. It encompasses two major environmental zones, the Cross Timbers and the Blackland Prairie (Dyksterhuis 1946). This environmental dichotomy is evident in both floral and faunal resources. Since climatic conditions are uniform over the project area, the basis for environmental diversity is attributable to other factors: bedrock geology, soils, and the results of differential hydrologic regimes within the project area. The details of these factors are described elsewhere (Ferring 1986a, 1986b). The importance of bedrock geology as a fundamental control of ecosystems and landform development is critical to the formulation of a strategy for investigating cultural ecology in the project area. The different lithologies (limestones, marls, sandstones, and shales) have different and predictable potentials for erosion, soil formation, and groundwater storage and release. In turn, these edaphic and hydrologic parameters define constraints on native vegetation, which in turn constitute habitats for animals. Thus, landforms, soils, ground and surface water, vegetation, and animal populations are distributed and related in dependent fashion. Ecologic and biogeographic relations within the project area at any given time are highly constrained by these factors.

Two other factors are important with respect to local ecology and biogeography: climatic change and human alteration of the physical-biotic landscape. Both of these factors are related and, together with the other factors mentioned, constitute a framework for investigating cultural ecology and landscape evolution. Also,

climatic conditions and human populations have changed throughout the 12,000 years of human occupation of this area. The goal of this project was to investigate the processes and results of changing cultural systems in the Lewisville Lake area, to relate these processes to regional records, and to explain these processes in terms of anthropological theory. The dichotomization of prehistoric and historic research methods in this design is simply an artifact of the qualitative and quantitative differences in the nature of evidence for human lifeways between these two cultural eras. Conceptually, these two eras will be studied in similar fashion. Briefly, the implications of the ecologic setting and ecologic relationships will be defined for prehistoric and historic foci of the research design. The following are the prehistoric issues addressed during this study.

Prehistoric Issues

The culture history and cultural ecology of the Lewisville Lake area is addressed within a context of changing landscapes, changing plant and animal resources, and population dynamics. Understanding past environments in this area must begin with description of modern landforms, biotic communities, and climate/ hydrology. These provide a basis for studying past environments using geomorphology, soils, pollen, molluscs, and vertebrates recovered from well-dated stratigraphic units in the project area. Since many of these data have been recovered from archaeological sites, a basis for relating past environments to past adaptive strategies is established. The distinct biogeographic zonation in the project area today is expected to have prevailed in the past as well; therefore, the principal focus for change is climatic variation during the late Pleistocene and throughout the Holocene. These records are used to define probable shifts in resource availability, emphasizing both character and abundance of resources within the geographic mosaic of the project area. This biogeographic reconstruction provides the basis for spatial analysis of settlement locations relative to critical resources.

The next scale of analysis focuses on how specific places (sites) were used within this mosaic during different time periods and under potentially changing environmental conditions. "Place" analysis, i.e., site analysis, will be guided by the goal of defining patterns of mobility (including periodicity and intensity of occupations), as well as the specific resource extraction and processing activities that are associated with sites. For stratified sites emphasis is placed on temporal change in patterns of site use A clear focus for these studies is the evaluation of site-use change relative to changing resource availabilities.

These analyses required very specific kinds of data, including but not limited to: (1) a well-defined stratigraphic framework for the Pleistocene and Holocene sediments in the project areas (2) a geomorphic model of landforms in the project area integrated with the stratigraphy; (3) a radiocarbon chronology for the sediments and landforms; (4) evidence of past environments, including pollen, molluscs, vertebrates, and soils; (5) a site-location data base fully integrated into the geologic framework as well as the biogeographic framework; (6) a chronology of the sites, including dated episodes of site use; (7) data permitting site-use histories (8) data on site activities: tools, cores, debitage, and ceramics; (9) evidence of external contacts and intersite cultural affiliations: tool and ceramic styles; (10) a set of analytical procedures to integrate patterns of intrasite variability with patterns of intersite variability; and (11) a set of research hypotheses and theoretical constructs to explain the observed variability with reference to population dynamics, resource availability, and exploitation patterns. The result is a spatial-temporal model of adaptive strategies and cultural evolution, i.e., a model of cultural ecology (cf. Butzer 1982). A necessary outcome of such a model is a clear understanding of cultural history in this area, including comparison of the Lewisville Lake area to other studies in this region, e.g., Ray Roberts (Brown et al. 1990; Lebo et al 1990), Richland Chambers (Raab et al. 1982) and Joe Pool (Raab et al. 1980), Lavon (Lynott 1975), and also including smaller projects and avocational projects (cf. Lynott 1977).

Site Formation Processes

A guiding perspective for prehistoric investigations on this project was site formation processes (Schiffer 1976, 1983; Butzer 1982). This is an area of prehistoric archaeology that has made significant contributions to the study of site construction and site modification (Ferring 1986c). Essentially, the approach involves identifying the cultural and natural processes that shaped the resulting archaeological record. The intensity

and repetitive aspects of site use are related to potential disturbance or mixture of artifacts and features. Erosion, weathering, bioturbation, pedoturbation, and other natural agents modify the character of the archaeological materials and features. These all impact on the character of the preserved archaeological record and our ability to infer primary patterns of site use from that record. Our emphasis has not been strictly on site modification (cf. Wood and Johnson 1978), but rather on the joint consideration of site construction (including cultural activities within a given site formation environment) and the subsequent modification or alteration of that primary record.

This approach had already been used in the Ray Roberts Lake during the mitigation phase of investigations (Ferring and Yates 1997). Prehistoric sites in different geologic settings have been shown to have quite different formation contexts. Terrace sites, for example, exhibit much higher potentials for bioturbation and mixture of debris from serial occupation; by contrast, floodplain settings have better potentials for burial, superpositioning, and preservation of artifacts, faunas, and features. Thus, contrasting models of site formation are proposed and tested for terrace sites as opposed to floodplain sites. Results of these approaches can be used to evaluate newly discovered sites in the future, resulting in more efficient development of mitigation and management plans. In terms of the theoretical goals of the project, the issue of site formation is critical. Those dimensions of the archaeological record addressed by site formation analysis are critical to the study of intrasite patterning, artifact densities, spatial association of artifacts and features, and relative faunal preservation, and therefore must be considered in any evaluation of intrasite and intersite variability.

Field and Laboratory Methods

Field investigations included testing and excavation. Testing was performed by extensive use of backhoe trenching to expose vertical stratigraphy and to help delimit site boundaries. Manual excavation of 1x1 m test pits was employed at the five sites to obtain artifact samples and to determine artifact densities. Excavation was conducted as a means to mitigate adverse effects of the construction and filling of Lake Lewisville on cultural resources that were deemed significant and had been recommended for nomination to the National Register of Historic Places. The following descriptions outline procedures used in testing and excavation of prehistoric sites.

Testing Methods

Testing consisted of both digging backhoe trenches to sufficient depth and length to help delimit vertical and horizontal extent of cultural deposits and manual excavation of 1x1 m test pits. Maximum trench depth attainable was approximately five meters. Placement of trenches was based on site topography and nearest drainage. For sites situated adjacent to streams the trenches were dug perpendicular to the drainage. For larger sites the trenches were dug perpendicular to each other. This procedure maximized exposing varying stratigraphy within a site in order to better assess the likelihood of well preserved cultural horizons and features. Trenches were examined for the presence of cultural horizons, features, and artifacts. Detailed stratigraphic drawings, or profiles, were drawn of selected portions of the trenches.

Test pits were dug in arbitrary 10 cm levels. Thicker levels were always confined to removal of plowzones and/or overlying culturally sterile deposits. Deposits were dry sifted through 1/4 inch hardware cloth. Deposits associated with exposed cultural features were collected, according to their provenience, for fine screening with the use of water at the field laboratory. Fine screening consisted of using a high pressure water hose to dissolve the deposits within a 1/16 inch screen.

Excavation Methods

Excavation methods varied according to natural and cultural stratigraphy. Excavations consisted of

blocks that were contiguous 1x1 m units. Units were assigned unique sequential numbers within each block. All blocks within a site were oriented in the same direction. Provenience was according to East and South coordinates with the southeast corner of each 1x1 m unit denoting its location. Units were dug in arbitrary 10 cm levels. Fine screening of deposits was by arbitrarily selected units. All features and their associated contents were sampled for flotation and the remaining deposits were fine screened.

Plan views and profiles were drawn, and photographs were taken, of all discernible features. Culturally diagnostic artifacts (e.g., projectile points, pottery sherds, etc.) were plotted three dimensionally when possible. Large pieces of charcoal were collected for radiometric samples. Drawings were done of larger faunal elements that were in their primary context. Large pieces and concentrations of FCR were also mapped. The walls of completed block excavations were profiled and photographed. Artifacts from each provenience unit (1x1 m unit or feature) were placed in their own designated paper bag with appropriate provenience information written on the bag. Flotation samples were put in plastic bags with appropriate provenience information recorded on the bags. All artifact and flotation bags were assigned unique numbers (bag or lot numbers) by the crew chiefs upon checking the materials into the field laboratory. This procedure helped eliminate errors in recording of provenience information both in the field and laboratory. Deviations from the above methods are discussed within each site description.

Laboratory Methods

Laboratory procedures, for processing prehistoric materials recovered from field investigations, were divided into specific tasks that were completed by trained personnel. Artifacts bags, after having been checked into the field laboratory by the crew chiefs or designated person, were first emptied and the artifacts washed. Care was taken not to abrade bone and ceramics. Washed artifacts from each bag were placed in the open air to thoroughly dry before further processing.

After drying, artifacts from each bag were sorted on a tray into specific artifact categories that included bones, stone tools, debitage, ceramics, charcoal, FCR, mussel shell, and historic items. A tag with provenience information was completed for each artifact category. All artifacts of the same category were placed in boxes for further processing.

Recording artifacts was accomplished in two levels of specificity, unit coding and attribute coding. The lowest level of coding is called "unit coding" which consisted of recording counts and weights of materials. Debitage was sorted into two raw material types, cherts and quartzites. These were further divided into technological groups consisting of large and small (less than 1.5 cm along axis of force) flakes, and whether cortex was present or absent. The diagram below illustrates the typology used for debitage.

```
                         debitage assemblage

                  chert (others) ---------quartzite
                            /                 \
                            /                  \
           chunks -  large -  small       small - large - chunks
                     flakes   flakes      flakes  flakes
                       /\       /\          /\      /\
                      /  \     /  \        /  \    /  \
                      C   I   C    I      C    I  C    I
```

key: C = cortex   I = interior

Many units were excavated using fine screen (1/8 inch mesh window screen). This was done to increase microfaunal recovery. Naturally considerable small debitage was recovered from these units as well. In the lab, all debitage was sized again for unit coding, and fine screen samples were coded so that these units could be controlled for during assemblage analyses. Samples from each site reveal the quite consistent proportion of small debitage from fine screen recovery (Table 4.1). In this report, debitage from all units, including those that were fine screened, are reported for the assemblage totals only. All other data presentations (percent chert, cortical pieces, etc.) Are for the 1/4" screen samples only.

Table 4.1 Debitage Patterns from Fine Screening

SITE	LEVEL	MESH (in)	n	#/m3	sm/lg
DN20	25	1/4	134	89.3	
		1/8	127	423.3	4.7
	31	1/4	197	85.7	
		1/8	171	342	4.0
DN26	6	1/4	892	151.2	
		1/8	683	975.8	6.5
	8	1/4	883	192	
		1/8	375	625	3.3
DN27	17	1/4	67	167.5	
		1/8	74	740	4.4
	21	1/4	102	204	
		1/8	107	1070	5.2
DN372	6	1/4	1221	555	
		1/8	5018	2787.8	5.0
	8	1/4	806	447.8	
		1/8	1683	2404.3	5.4
DN381	14	1/4	224	101.8	
		1/8	449	898	8.8
	19	1/4	1451	213.4	
		1/8	2938	1088.1	5.1
	25	1/4	392	178.2	
		1/8	264	880	4.9

Fire-cracked rock (FCR) was only weighed. Mussel shell was also weighed with a count made of left and right valves (hinges) to acquire a minimum number of individuals present. Faunal remains were sorted into

two main groups, unidentifiable and identifiable. Unit coding for unidentifiable bone consisted of sorting and counting burned and unburned bone and recording total weight.

The higher level of coding, attribute coding, was done for identifiable bone, stone tools, and ceramics. More detailed information was recorded for these materials. For identifiable bone the taxonomic, taphonomic, osteological, and technological (bone tools, butchering marks, etc.) attributes were recorded. For stone tools the raw material, morphological, technological, stylistic, and functional attributes were recorded. Attributes recorded for ceramics included technological, functional, stylistic, and taphonomic information.

The following are descriptions of classes of artifacts recovered during field investigations at Ray Roberts Lake. The classes of artifacts are based on morphological and functional characteristics. Artifacts were initially sorted into eight categories: 1) debitage; 2) tools; 3) projectile points; 4) ceramics; 5) fire cracked rock (FCR); 6) mussel shell; 7) unidentified bone (UNID); and 8) identified bone (ID). Each of these categories was treated separately with a special computer coding form devised for each. The following section describes the variables recorded for each of the above categories on their respective computer coding forms.

The method for recording provenience information was the same for all of the above artifact categories with the exception of faunal remains. For all of the categories except faunal remains the first 20 columns of the computer coding forms were devoted to provenience information. This information was recorded in the following manner.

column	information
1	site type (not used)
2	county (1=Denton, 2=Cooke, 3=Grayson)
3-5	site number (sequential within the county)
6	block number (sequential within the site)
7-8	unit number (stratigraphic unit within the block)
9-10	excavation level number (sequential within the block)
11-13	base of level below site datum in cm
14-15	East axis coordinate from site datum in m
16-17	South axis coordinate from site datum in m
18	quad number (1=NW corner of 1x1 m, 2=NE corner of 1x1 m, 3=SE corner of 1x1 m, and 4=SW corner of 1x1 m)
19	feature number (sequential within the block or level)
20	recovery (not used)

Debitage

Debitage consists of flakes and chunks/shatter. A flake is any piece of chert, flint, or other raw material that has been removed from a larger mass by the application of force and that has at least one of several distinguishing characteristics: (1) a striking platform remnant; (2) a point of percussion or force; (3) an erralieure; (4) a bulb of force; (5) compression rings; (6) a termination; (7) platform preparation; (8) previous flake scars; or (9) arris. Chunks/shatter are any piece of chert, flint, or raw material that is cubical or irregularly shaped and lacks any well-defined pattern of negative or positive bulbs of force, striking platforms, or systematic alignment of cleavage scars on the various faces (Binford and Quimby 1963).

Debitage was sorted initially sorted into two major groups based on type of raw material, chert and quartzite. These groups were further sorted into types of debitage based upon size and cortex. Large flakes were sorted from small flakes on the basis of length along the axis of force. Flakes 1.5 cm long or greater were considered large flakes while flakes less than 1.5 cm were considered small.

column information

column	information
23-25	large interior chert flakes
26-28	small interior chert flakes
29-31	large chert flakes with cortex
32-34	small chert flakes with cortex
35-36	chunks of chert
39-41	large interior quartzite flakes
42-44	small interior quartzite flakes
45-47	large quartzite flakes with cortex
48-50	small quartzite flakes with cortex
51-52	chunks of quartzite
55-59	lot number (assigned in the field)

Lithic Tools

Classification of tool types was based on both functional and morphological attributes. Length and thickness measurements were made with a calipers. A goniometer was used for measuring the use-edge angles to the nearest 5 degrees, and a balance beam scale was used to record weight.

A large number of variables were recorded for stone tools. Variables include raw material type, technological characteristics such as platform type, percent of cortex present, site blank type, tool type (functional type), tool part, weight, edge angle, and evidence of heat treating (Table D1, Appendix D).

Ceramics

Determination of tempering materials was based on examination of a fresh break on the edge of the sherd with the aid of a binocular microscope at 20X-50X. Calipers were used to determine sherd size and thickness. Technological, stylistic, and functional variables were recorded for ceramics. Technological variables include temper type and thickness. Stylistic variables include interior and exterior surface treatment, base shape, and type of base. Functional variables include temper type, thickness, base shape, and type of base. Two pages of coding information was required to record the attributes.

column information

column	information
21-22	no temper (01)
23-24	grog/grit/bone temper (02)
25-26	grog temper (03)
27-28	grit temper (04)
29-30	bone temper (05)
31-32	shell temper (06)
33-34	sand temper (07)
35-36	limestone temper (08)
37-38	indeterminate temper (09)
39-40	shell/grit temper (10)
41-42	sand/shell temper (11)
43-44	grog/shell/bone temper (12)
45-46	grog/grit/bone temper (13)
47-48	shell/bone temper (14)
49-50	sand/shell/bone temper (15)
51-52	sand/bone temper (16)
53-54	sand/grog temper (17)
55-56	bone/grog temper (18)

61 base shape
1=disk
2=square
3=circular
4=indeterminate
62 type of base
1=flat
2=round
3=other
4=indeterminate
63-66 lot number (assigned in the field)

Flotation Samples

A total of 54 flotation and fine-screen charcoal samples was submitted to Dr. Bruce Albert, who examined each of these under magnification at UT Austin. These derived from feature and non-feature contexts from four sites (41DN26, 41DN27, 41DN372 and 41DN381). The fine screen samples had been hand picked in the archaeology laboratory, while the flotation samples included all of the light fraction from flotation, including numerous rootlets. All of the charred material was wood or small, unidentifiable fragments. He found no nutshell, which is usually present in such materials. All of the plant seeds were uncharred and designated as intrusive. Particular attention was paid to the possible presence of corn or other cultigens, and none were found.

Faunal Remains

Faunal remains were divided into unidentified and identified elements. The first key is for unidentified bone. Unidentified bone was sorted into burned and unburned pieces and then weighed The second key is for identified bone (Appendix C, Tables C1, C2).

CHAPTER 5: 41DN20

Description

Site 41DN20 is located at an elevation of 520-535 feet MSL on a sandy colluvial slope above its juncture with the Little Elm Creek floodplain (Figures 1.2, 5.1). The site was relocated in 1987 as an area with a light midden stain and surface scatter of lithic debris in eroded areas. The Corps of Engineers' boundary traverses the center of the site in the north-south direction with the western portion occurring on private land.

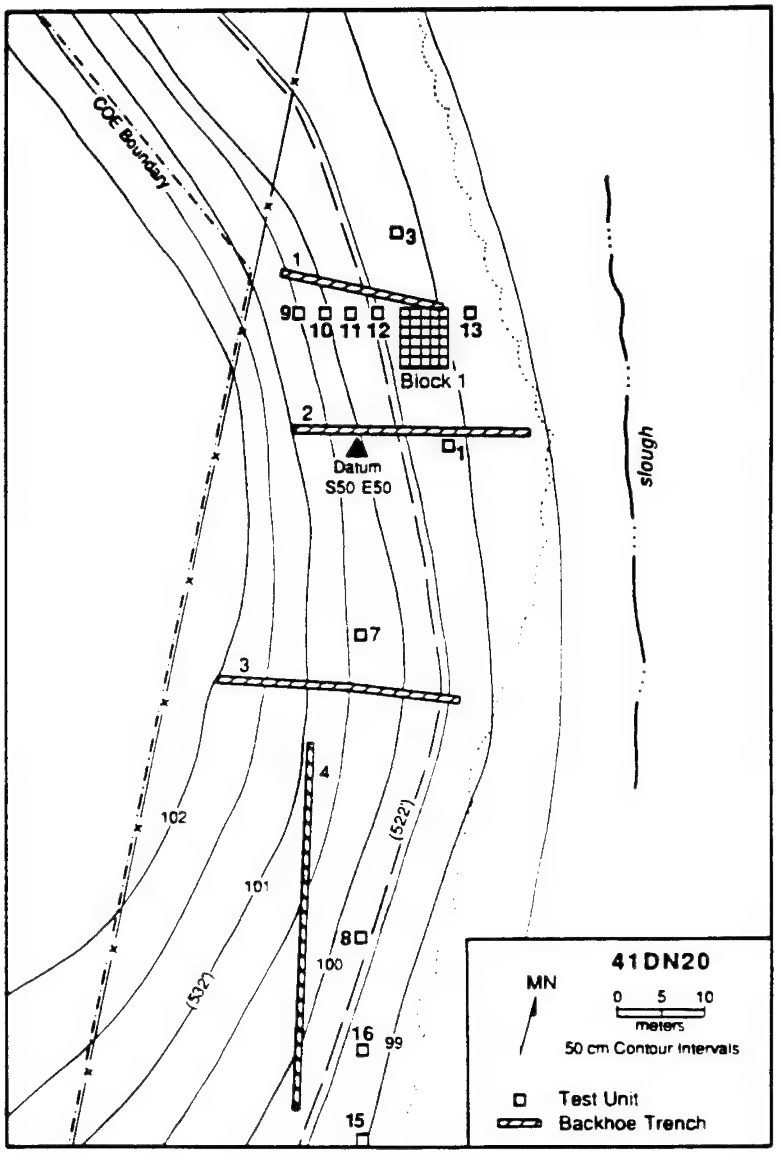


Figure 5.1 Map of site 41DN20. Note Pleistocene terrace on western part of area and floodplain of Little Elm Creek on the east. Site formed in colluvial sediments at base of the terrace scarp. Note relationship to Site 41DN381 to the north (Figure 1.2).

The site is located about 150 m south of site 41DN381, but is in a different sedimentary context. Bedrock crops out upslope from the site, where it is veneered with terrace deposits. The bedrock has preserved a knoll above the site that apparently has controlled erosional-depositional processes during the late Pleistocene and Holocene. In contrast to the long, gentle slope at 41DN381, site 41DN20 has a steep upper slope (Figure 5.1). Test excavations, including backhoe trenches, revealed that the colluvial sediments thickened downslope, and at the toe of the slope sediments containing deeply buried artifacts were preserved (Figures 5.2, 5.3). Artifacts recovered during testing indicated that a shallow Late Prehistoric component was present and that Early to Middle Archaic materials were buried deeper in the colluvial section.

Late Holocene erosion apparently has stripped the upper part of the sediments, presumably removing a soil that probably formed there in the Middle-Late Holocene period. The soil is today only registered by concentrations of FeMn (ferro-manganese) concretions in the C-horizon below the modern A-horizon. Soils studies in the Upper Trinity basin have shown that such concretions are quite good age indicators for soils, especially in sandy sediments (Ferring 1993). Several thousand years are required for them to accumulate, and their size and number increase through time as the sediments weather. Here, the lack of a B-horizon associated with the surface soil indicates that it was probably removed, as the concretions do not appear to be genetically related to the modern surface soil.

Given the age of the artifacts recovered in the lower part of Block 1, the sediments there are assumed to be of Early-Middle Holocene age. The upper sediments are much younger, and contain Late Holocene artifacts of Late Archaic and Late Prehistoric age.

The lower sediments exposed in Block 1 overlie a truncated soil B-horizon (Figure 5.2). This soil is almost certainly of Late Pleistocene age, and may correlate with the soil under the Clovis horizon at the Aubrey Clovis site (Ferring 1990, 1995a). That soil registers a period of latest Pleistocene landscape

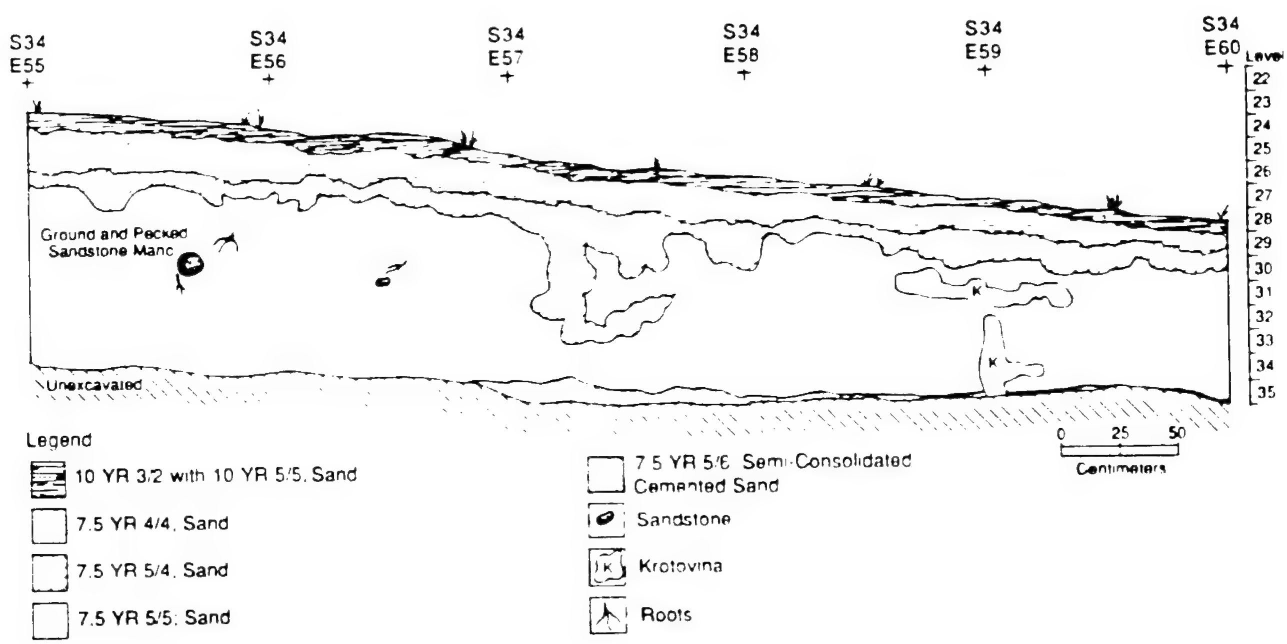


Figure 5.2 North Profile of Block 1 at 41DN20.

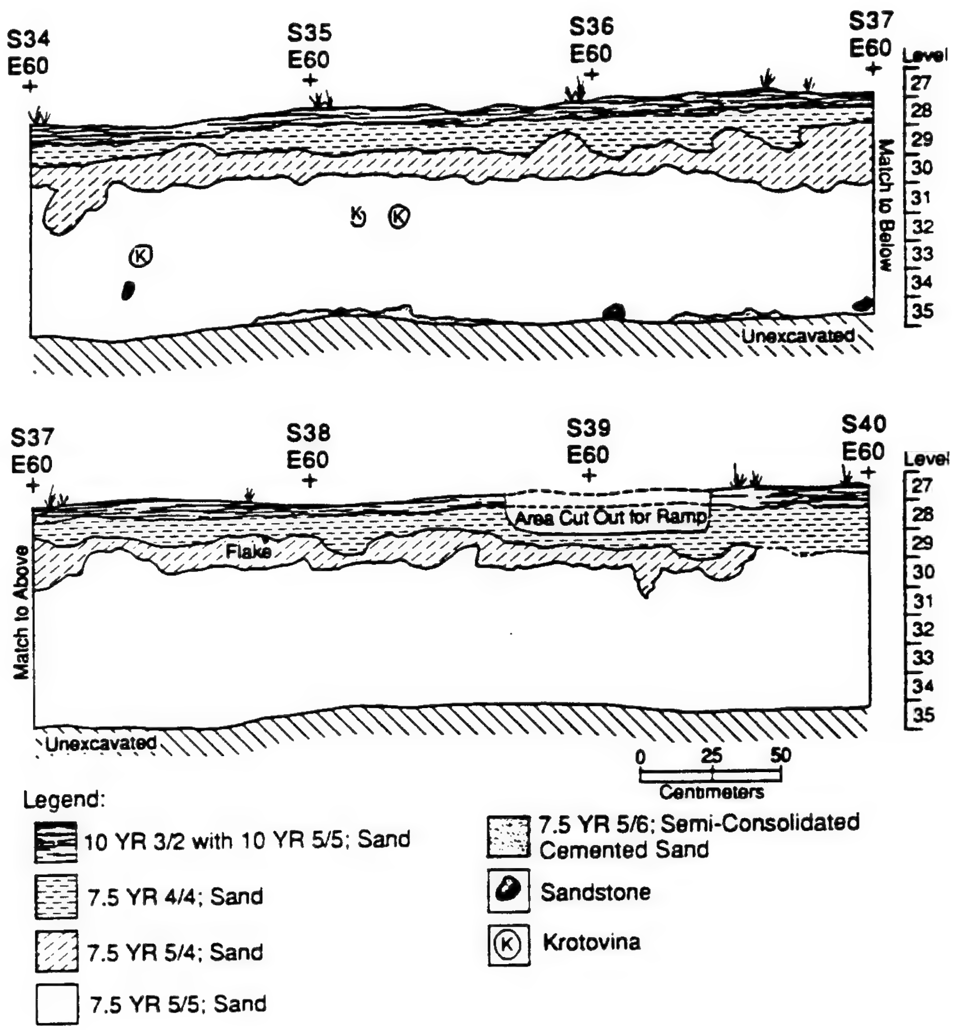


Figure 5.3 East Profile of Block 1 at 41DN20.

stability. After ca. 11,000 years ago, rapid floodplain aggradation began in the Upper Trinity Basin; logically, this was accompanied by slope erosion and colluvial deposition along the margins of flood plains. A similar history is recorded for site 41DN102, where in situ Middle Archaic deposits were found below a terrace scarp and adjacent to the floodplain (Ferring and Yates 1996).

At 41DN20, therefore, it appears that the Early/Middle Archaic archaeological materials were preserved in the Early-Middle Holocene colluvial sediments at the base of the colluvial slope. Middle to Late Holocene erosion, followed by Late Holocene accumulation of colluvium is registered here and at 41DN381. Fortunately, the erosion here was not sufficient to remove the older archaeological materials preserved in the lower part of Block 1. Unfortunately, the sandy sediments did not foster preservation of bone or charcoal, leaving serious questions about the absolute age of the site and the nature of the adaptations of the Early-Middle Archaic occupants. On the other hand, this is the first in situ site of this age that has been documented in north central Texas, as it appears to be older, based on tool typology, than the Middle Archaic occupations at 41DN102, Block 2 (Ferring and Yates 1997). 41DN20 could yield important data on the lithic technology and typology of that period(s), and was therefore the subject of mitigation excavations.

Previous Research

Testing consisted of four BHT's and manual excavation of six 1x1 m TP's (Figure 5.1). Four of the TP's were contiguous, forming a 2x2 m unit. The artifact assemblage consisted almost entirely of lithic debris and stone tools. TP's yielded 10-20 pieces of chert and quartzite debitage from each 10 cm level. Bottle glass was recovered from TP 5, level 12. The location of the site on a slope as well as the sandy sediments reduced preservation of organic remains. Results of testing indicated few preserved faunal and floral remains and little probability of well-preserved features (Brown and Lebo 1990).

Excavation

Excavation in 1988 by UNT included extending BHT 1 onto the Little Elm Creek floodplain, manual excavation of nine additional 1x1 m TP's (TP's 7-16; TP 14 was not excavated), and expanding excavations around the 2x2 m area excavated during testing into a 5x6 m block of 30 contiguous 1x1 m units (Figures 5.1, 5.4). The TP's were placed both upslope and downslope of B 1 in order to better delineate the occurrence of cultural material at the site. Excavations did not yield any features and only a few faunal remains. Additionally, datable charcoal; samples could not be recovered. This scenario was expected after results of initial testing.

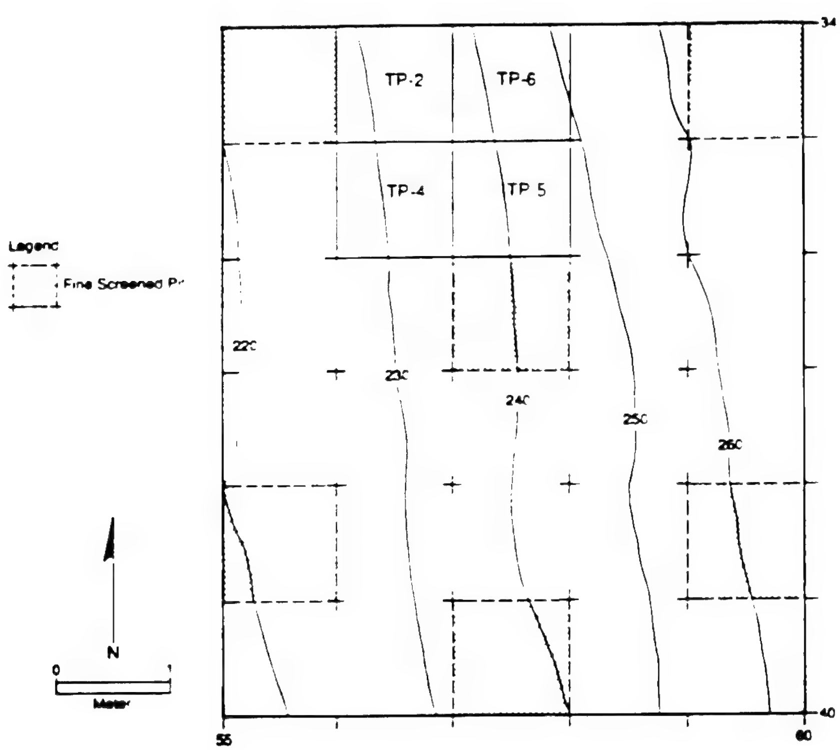


Figure 5.4 Surface contour elevations of Block 1 at 41DN20.

Six 1x1 m units within B 1 were selected for fine screening (Figure 5.4). There appear to be three strata (Figures 5.2, 5.3) with the uppermost, consisting of levels 13-25, being attributed to a Late Prehistoric II occupation based on recovery of an arrow point and a pottery sherd. (NOTE: Because of the slope across the site, the highest level for any unit corresponds to the relative elevation of the ground surface of that unit). The Archaic component is confined primarily to Stratum 3 which has been moderately bioturbated in its deeper section above the buried B-horizon.

Nine 1x1 m test pits were excavated and the matrix screened (Figure 5.1). These TP's were excavated to help determine the stratigraphic occurrence of cultural remains perpendicular to the sandy knoll. Therefore, most of the TP's were placed upslope and/or downslope from B 1. Tables A20.1-3 (Appendix A) show the frequencies of artifacts recovered from the TP's. Most cultural remains from TP's were recovered from those along the S 35 line, upslope and downslope from B 1. Artifact frequencies also increase for those TP's situated closer to B 1. Projectile points recovered from the nine TP's include Ellis-like, Yarbrough, Trinity and three untyped point fragments. A graver and several Clear Fork Gouges were also recovered in the test units. Results of excavating the TP's indicate the base of the slope below the bedrock knoll, in the area of B 1, contains the densest accumulations of cultural material. The top of the sandy knoll, located west of B 1 on private property, has been extensively eroded and therefore may be the source for the materials recovered down slope in B 1.

Block 1

No features were found in the Block 1 excavations. A total of over 3,700 lithic artifacts were recovered, most of which come from the lower part of the section (Table 5.1). In contrast to the Late Prehistoric, projectile-dominated assemblages described elsewhere in this report, the earlier assemblage

Table 5. 1 Assemblage Composition, DN20, Block 1

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	GRND ST	TOTAL
23	86			1	1		88
24	185						185
25	231			1	1		233
26	284			1			285
27	372				2		374
28	492			1	4	1	498
29	428	1	1		1		431
30	364	1	1	4	6	1	377
31	349	1	4	3	6	2	365
32	433	2	2	5	12	3	457
33	239	3		2	4	2	250
34	132	2	1	8	3	1	147
35	28			3	1		32
TOTAL	3623	10	9	29	41	10	3722
PCT	97.34	0.27	0.24	0.78	1.10	0.27	

(levels 28-35) is not dominated by points. About 20% of the artifacts are cores or blanks and almost 30% of the artifacts are retouched tools.

Only about half of the retouched tools below level 28 are simple retouched pieces (Table 5.2). The remainder are quite indicative of the fact that this is an unusual assemblage compared to the rest of the sites studied at Lewisville Lake and Ray Roberts.

Table 5. 2 Tools and Cores. DN20 Block 1

CLASS/type	LEVEL											
	23	25	26	27	28	29	30	31	32	33	34	35
UNIFACIAL TOOLS												
Retouch	-/1	1/-	1/-		1/-		2/-	1/-	3/-	1/-	1/-	1/1
Ret. blade												1/-
End scraper							-/1			-/1	2/-	
End+side scr								-/1				
Mult. tool											1/-	
Drill							1/-		-/1			
Gouge									1/-		1/2	
Bifacial knife									-/1			
Burin on biface											1/-	
Total	1	1	1		1		4	2	6	2	8	3
% Chert	0	100	100		100		75	50	67	50	75	67
BIFACE FRAGMENT	-/1		1/-					1/-	2/1	1/-		
BLANK-PRE						-/1	-/1	-/4	-/2		-/1	
CORES												
Single plat						1/-		1/-		-/1	-/2	
Multiple plat										-/1		
Radial									-/1	-/1		
Core fragment							-/1		1/-			
Total						1/-	-/2	1/-	1/1	-/3	-/2	
GROUND STONE												
Prepared mano							1					
Unprepared metate								1				
Hammerstone					1			1	3	2	1	
Total					1		1	2	3	2	1	

/ = Chert/Quartzite

Four of the tools are gouges. Two are "typical" Clear Fork gouges, one on ferruginous (hematitic) sandstone (Figure 5.5, 34 e), and the other on petrified wood (Figure 5.5, 31 f). The third is a large gouge preform, bifacially prepared and ground. It is similar to one found in the Middle Archaic horizons at 41DN102 at Ray Roberts (Ferring and Yates 1996). The fourth one is made of very light colored, exceptionally fine-grained Ogallala quartzite (Figure 5.5, 34 d). Its concave bit is quite sharp, but one long curved edge has been polished heavily either through use or manufacture. These gouges, with their ambiguous functions, are hallmarks of Early to Middle Archaic assemblages in this region (Story 1990b).

The other tools include a multiple burin made on a rectangular mid-section fragment of a lanceolate chert projectile point that still bears parts of its ground lateral margins. One large bifacial knife fragment, made of fine-grained Ogallala quartzite was recovered from level 34. Two narrow but robust chert drills are both distal fragments, and may have been reworked projectile points.

The "multiple tool" is a large buff chert flake that has steep scraper retouch along one long edge, flat "unifacial knife-like" retouch along the opposite edge, and a graver on the distal end. A retouched quartzite blade and three typical end scrapers complete the sample of formal tools.

The biface fragments all appear to be dart point fragments of which only one from the deeper levels is not chert. All of the blank preforms, however, are made of Ogallala quartzite. This contrast between tool and blank-preform raw materials is characteristic of virtually all sites studied at Lewisville and Ray Roberts, and is seen as evidence that finished tools made of chert were probably carried to this area.

The cores in the sample include single platform, multiple platform and two small radial forms. Only two of the cores are made of chert, the rest are on Ogallala cobbles.

There is little change in the debitage in the lower levels (Table 5.3). Notable is the high proportion of chert, averaging about 28%. Also notable is the high proportion, ca. 75%, of large pieces (recalling that the data in Table 5.3 do not include fine-screen materials).

Table 5. 3 Debitage. DN20. Block 1

	QUARTZITE				CHERT					INDICES		
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									TOTAL	%	%	%
23	7	2	8	4	6	3	5	4	39	46.15	33.33	53.85
24	22	6	29	12	6	1	15	6	97	28.87	25.77	63.92
25	27	6	35	8	8	1	18	8	111	31.53	20.72	62.16
26	22	4	46	24	14	1	17	12	140	31.43	29.29	70.71
27	27	5	44	23	16	2	25	6	148	33.11	24.32	66.22
28	45	3	56	23	24	4	29	8	192	33.85	19.79	60.42
29	42	4	73	17	19	0	33	11	199	31.66	16.08	67.34
30	26	3	49	27	7	1	30	4	147	28.57	23.81	74.83
31	14	3	52	28	10	2	16	6	131	25.95	29.77	77.86
32	23	3	55	27	13	0	19	8	148	27.03	25.68	73.65
33	14	2	41	31	12	0	27	11	138	36.23	31.88	79.71
34	8	0	21	16	4	0	12	1	62	27.42	27.42	80.65
35	0	2	2	2	0	0	2	2	10	40.00	60.00	80.00

The projectile point sample includes a Toyah point from level 25, which, along with a single sherd in the same level simply documents some use of the site area much later than the principal occupations. In the lower levels, 33 points were recovered, 25 of which are classifiable to some degree (Table 5.4). Almost all of these exhibit "early" characteristics, and, except for one specimen in level 27, there is no evidence of admixtures from any younger occupations.

Table 5.4 Projectile Points. 41DN20 Block 1

	LEVEL									
ARROW PT	25	27	28	29	30	31	32	33	34	35
Toyah	1/-									
DART PT										
Expand stem A			2/-							
Expand stem B					1/-					
Palmer			1/-					-/1		
Trinity						2/-	-/1	1/-		
Split stem					1/-	-/1	1/-		1/-	
Straight stem					-/2					
Tortugas						1/-				
Kirk							-/1			
Wells						-/1				
Lanceolate								1/-		
Side-notched straight							1/-		2/-	
Side-notched convex					-/1		2/-			
cf Plainview		1/-								
Indeterminate		-/1	1/-	1/-	1/1		-/2			-/1
TOTAL	1	2	4	1	7	5	8	3	3	1
% Chert	100	50	100	100	43	60	50	67	100	0

"/" = CHERT/QUARTZITE

The sample shows a few trends from level 35 up to level 28. Expanding stemmed (with both straight and convex bases) tend to occur a little higher than the split stemmed forms (Figure 5.5). All of these have heavy basal grinding and exhibit intensive normal or bevelled resharpening. Straight-stemmed forms are also more common higher in the section. These each have heavy stem grinding as well. The Trinity-like points are in the middle of the section (eg., Figure 5.5, 31, d-e). These are small forms, with heavy basal grinding and bevelled resharpening. These co-occur with the Wells (Figure 5.5, 31 b) and the Kirk specimen (Figure 5.5, 32 a). The split stemmed points occur between levels 34 and 30. Each has basal grinding up to the blade of the point (eg., Figure 5.5, 30 e, 31 c, 34 a). In the same levels are side-notched points, including those with rounded bases and those with straight bases. All four have basal grinding, and two have fine parallel pressure resharpening of the blades.

A Tortugas point was found in level 31 (Figure 5.5, 31 a). This piece is made of an unidentified red-gray chert. It is very thin and has been made with very controlled large thinning flakes and carefully sharpened with pressure retouch. The base has been bifacially bevelled with extremely fine, parallel pressure flaking. Overall, the points in the lower levels of the site all exhibit Early to Middle Archaic traits, either in terms of gross point morphology and or with respect to patterns of basal grinding and resharpening.

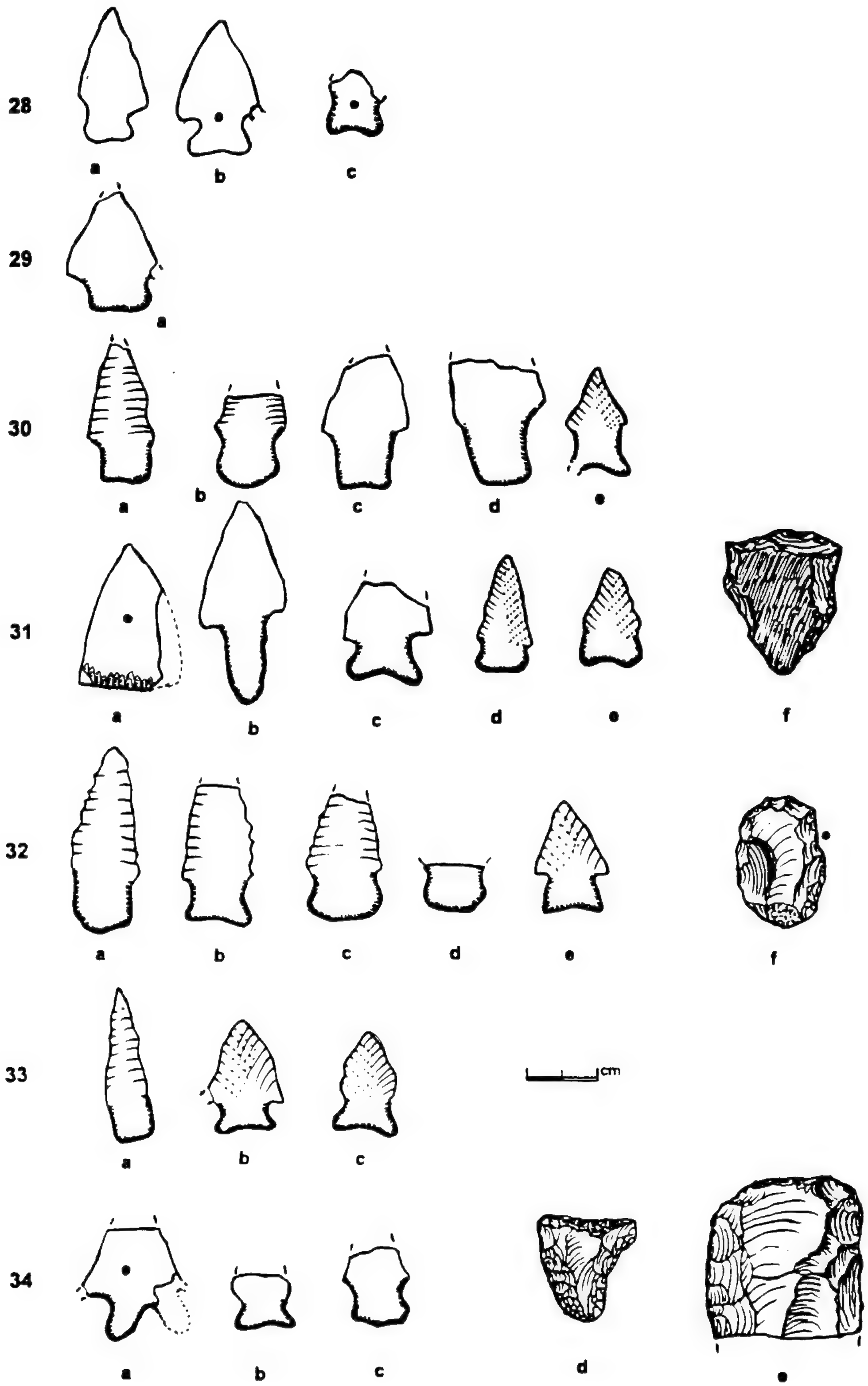


Figure 5.5 Lithic Tools Recovered from 41DN20. Pieces marked with dots are made of chert; others are all Ogallala quartzite, except ferrugeneous sandstone (34 f), petrified wood (31 f) and white quartzite (33 b). Symbols: diagonal lines = bevelled resharpening; perpendicular lines = bifacial resharpening; shaded edge = grinding. 31 f,g are scrapers; other retouched tools are gouges.

Ground stone tools recovered from B 1 consist of a loaf-shaped prepared mano from level 30, a double sided metate from level 31, and several hammerstones (Table 5.2). The metate fragment has deep grinding depressions on both sides and is made from a very coarse-grained sandstone that has not been seen in the bedrock near the site; its source is not known.

A single shell/sand tempered Nocona Plain sherd was recovered from level 25 in Block 1, along with the Toyah arrow point. No other diagnostic tools were found in these higher levels.

Very little FCR was recovered from B 1 (Table 5.5). That which was recovered consists of very small fragments scattered throughout the block. There were no features exposed with which the FCR may have originally been associated with. No mussel shell was recovered from the site.

Table 5. 5 Density Data. DN20. Block 1

LEVEL	debden (n/m3)	toolden (n/m3)	rockden (g/m3)	boneden (n/m3)	% burned bone
23	65.0	3.3	27	5.0	56
24	97.0	0.0	11	3.0	55
25	79.3	1.4	14	5.0	50
26	87.5	0.6	67	2.5	51
27	74.0	1.0	22	3.5	50
28	91.4	2.9	53	9.5	45
29	99.5	0.5	136	4.5	43
30	81.7	6.1	224	1.1	44
31	68.9	5.8	370	1.1	42
32	77.9	10.5	102	2.6	38
33	72.6	4.2	377	0.0	42
34	51.7	10.0	188	0.0	33
35	33.3	13.3	153	0.0	42
Mean	83.2	2.6	127	3.9	44
Std Dev	12.5	3.5	127	2.7	5

Faunal Remains

Only 34 identified bones were recovered from this site. Table 5.6 lists the taxa by block and level. The composition of faunas is consistent in types of animals seen at other sites in the Lewisville study area, but greatly reduced in frequency. Preservation factors have not been conducive to osteological survival, and consequently interpretation of the meat diet from these meager remains is not productive. Of interest, however is the presence of Bison/Bos/Elk in the lower levels. If they are indeed Early Holocene in age, then Bison presence would be of paleoenvironmental significance, since no faunas of that age are known from this region.

Table 5.6 Identified Vertebrates from 41DN20*

Taxon	Cultural Components** LP	EA/MA
Drum		1/1
Carp		1/1
Box Turtle		1/1
Indeterminate Turtle	3/1	3/1
Non-poisonous Snake	1/1	1/1
Cottontail	1/1	1/1
Pocket Gopher	1/1	
Cotton Rat	2/1	2/1
Woodrat	1/1	
Deer	1/1	3/1
Cow/Bison/Elk		4/1
Indeterminate Mammal, large	3/-	3/-

*Values expressed are NISP/MNI for each taxon.
** LP = Late Prehistoric; EA/MA = Early/Middle Archaic

Summary

Site 41DN20 contains what may be the first intact assemblage of Early/Middle Archaic artifacts from this region. The types of unifacial tools and some of the projectile point styles (such as Wells, Trinity) were found at the Middle Archaic component at 41DN102 at Ray Roberts (Ferring and Yates 1997). Other point types such as split-stemmed, Kirk, and expanding stemmed forms, and the Clear Fork gouges are associated with Early Archaic assemblages to the east and south of the study area (Story 1990b). Without better stratigraphic data and radiocarbon dates, it will remain difficult to know the age and associational integrity of this assemblage. On the other hand, it is buried, is a relatively thin deposit, and appears to be internally consistent insofar as it bears similarities with published models of Early Archaic assemblages, and does not have any traits that suggest it is younger than the Middle Archaic at 41DN102. As such, it may serve as a basis for evaluating new assemblages when they may be found.

CHAPTER 6: 41DN26

Introduction

Site 41DN26 is located at an elevation of 530-550 feet MSL at the crest and shoulder of a gentle colluvial slope to the south of and above the Little Elm Creek floodplain (Figures 1.2, 6.1). The site is situated about 1 km east of the confluence of Little Elm Creek and Running Branch Creek.

The surface on which the major portion of the site occurs is an eroded outcropping of Woodbine sandstone (Barnes 1967). In the site area these Cretaceous sandstones are fine-grained, medium to thick bedded and friable. They weather into sandy loam and loamy sand soils that are easily eroded and prone to quite intensive bioturbation by plants and animals. In the area of the site, large carbonate-cemented concretions occur as boulders. These formed in the sandstone bedrock. Interestingly, these may have buffered the soil Ph, enhancing bone preservation in the fine sandy sediments.

Upslope, to the south-southeast of the site are gravel and overlying thick clay sediments of the Coppell Alloformation (Ferring 1993). These are alluvial deposits associated with the Late Pleistocene Hickory Creek Terrace. In the lower part of the site, thick colluvial sands overlie eroded bedrock; at the base of the colluvial slope is the Little Elm Creek floodplain.

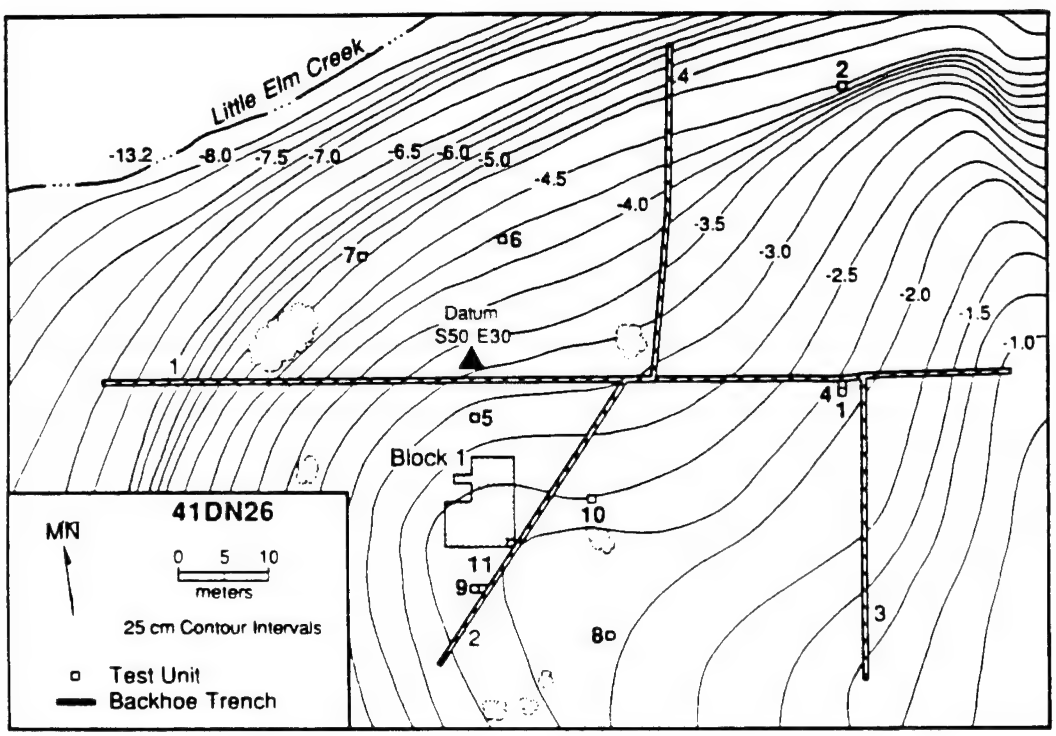


Figure 6.1 Map of site 41DN26. Site formed in colluvium and also residual sediment from weathering of underlying Woodbine sandstone. Note floodplain of Little Elm Creek north of the main site area, and similar setting of Site 41DN27 (Figure 7.1).

The native vegetation of the site area was mixed oak savannahs of the Eastern Cross Timbers, but the site is located not far west of the edge of the Blackland Prairie. The site has been cultivated in the past, and today is covered by grasses, forbs and a few trees. Site DN26 is situated almost exactly in the same manner as DN27, located about 700 m to the east, on the same side of Little Elm Creek (Figure 1.2)

Previous Research

Testing in 1988 by UNT consisted of four BHT's and manual excavation of 11 1x1 m TP's (Figure 6.1). The TP's were dug to depths 50 to 150 cm below ground surface. Cultural remains recovered included large quantities of lithic artifacts, a few ceramic sherds and fauna. The ceramics were shell-tempered and are assigned to Nocona Plain ware. Recovered projectile points included Bulverde, Edgewood, Dallas, Trinity, Gary, Alba, Hayes, and Bonham types (Brown and Lebo 1990).

Stone tools, Nocona Plain ceramic sherds, and well-preserved fauna were recovered during testing. Except for bioturbation, the site appeared to be in primary context, and to contain a significant record of Late Prehistoric and, to a lessor degree, Late Archaic occupations. On this basis, UNT recommended mitigation of the site.

Excavation

Excavation in 1988 by UNT included a single block with 67 contiguous 1x1 m units (Figure 6.2). Seven 1x1 m units were selected for fine screening the matrix to recover smaller artifacts and microfaunal materials (Figure 6.2). All other matrix was screened through 1/4" mesh. The Block 1 excavations were done to an

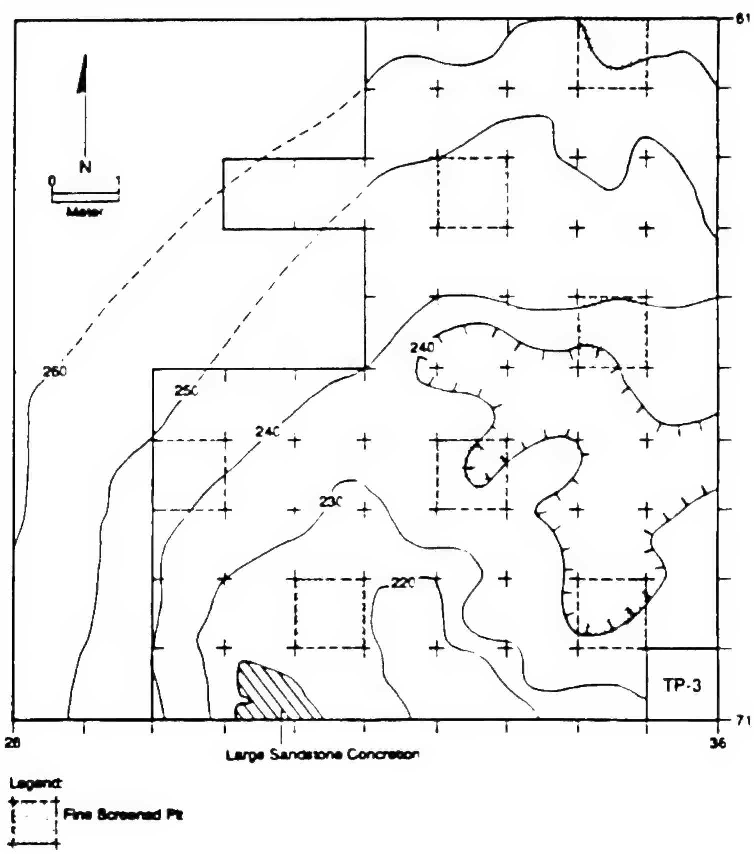


Figure 6.2 Surface contours and grid of Block 1 at 41DN26.

average depth of 70-80 cm below the ground surface (Figures 6.3, 6.4). Because of the slope, this entailed recovery of materials from arbitrary levels 1-14. The irregular boundaries between soil horizons are indicative of bioturbation at the site. This was caused by fossorial mammals and also by ubiquitous large tap roots of bullnettle, which was very common in the areas of sites DN26 and DN27.

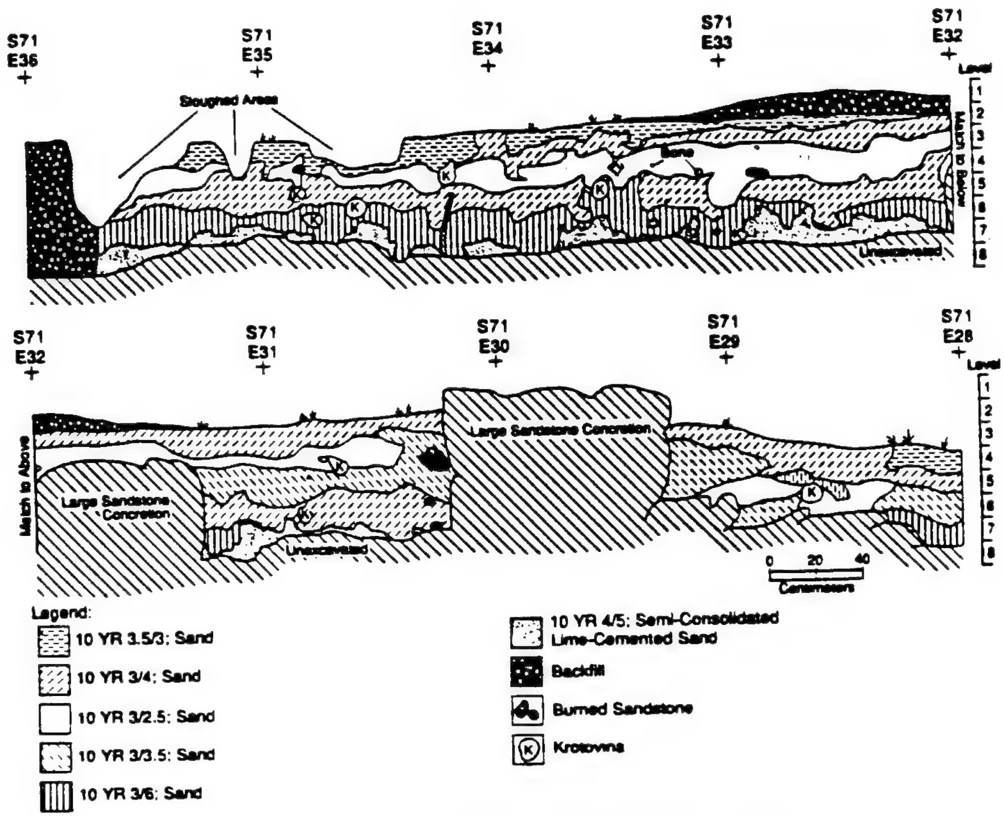


Figure 6.3 South profile of Block 1 at 41DN26. Concretions are resistent features within Cretaceous Woodbine sandstone.

Features

Nine features were discovered within B 1. Five features (Features 1, 3, 6, 7, and 8) consisted of dark soil stains with associated bone, lithics, FCR, and charcoal. Features 4 and 9 were primary and secondary human interments. Feature 2 included two Bison long bones and Feature 5 is a pit. Table 6.1 shows the size and provenience all of the features, which are also shown in Figure 6.5.

The five fire-related features (Features 1, 3, 6, 7, and 8) consisted of diffuse scatters of FCR, bone, lithics, and charcoal (Figure 6.3). Feature 1 was a partially excavated hearth with the eastern portion extending into the wall of B 1. It measured approximately 125x45 cm and was contained within excavation level 3. Feature 3 was hearth-like, extending through excavation levels 5-6 and measuring approximately 130x140 cm.

Features 6, 7, and 8 are amorphous stains that tend to overlap each other. Feature 6 occurred in levels 4-9 while Features 7 and 8 occurred within levels 6-7 and 7-10, respectively. These irregularly shaped stains with associated debris are believed to represent hearth cleaning debris from nearby hearths that were being reused.

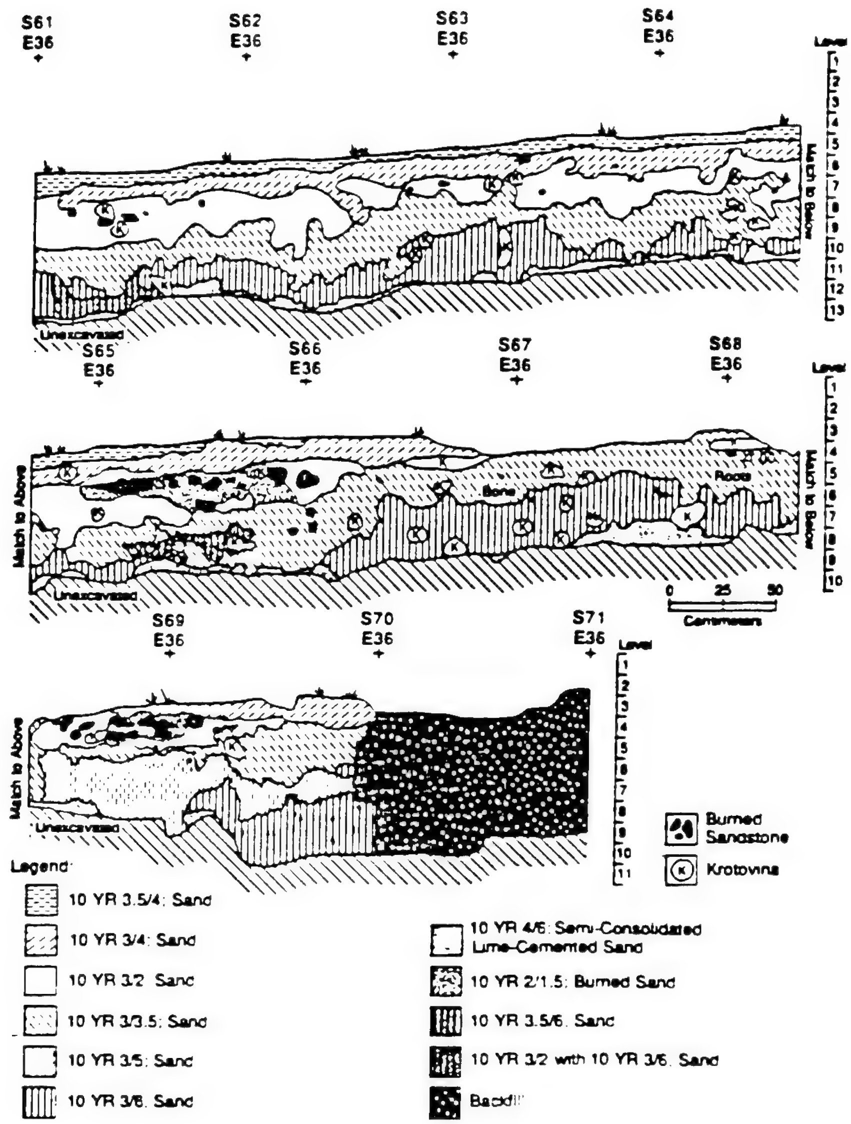


Figure 6.4 East profile of Block 1 at 41DN26

Feature 2 consisted of bovid two long bones in level 5. immediately below Feature 1. Feature 5 consisted of a dark soil stain that began at the base of level 8 and continued into the cemented B horizon. The pit, measuring approximately 120x40 cm. extended into the east wall of B 1. Its function is not known.

Features 4 and 9 are partial human interments. Feature 4 was a prepared pit, measuring approximately 95x77 cm, that was dug into the cemented B horizon. The poorly preserved skeletal remains were those of an adult; the cranium and mandible were not present; the body was in a flexed position. Feature 9 consisted of a soil stain that appeared to be a prepared pit; it contained two human mandibles. This feature spatially overlapped, but was stratigraphically below (level 9), Feature 7. This human interment appears to have been a secondary burial. The absence of other skeletal elements is difficult to explain via soil chemistry or bioturbation, since large quantities of other animal bones are well-preserved in the same horizon. Therefore, a cultural explanation is most likely required for this burial pattern.

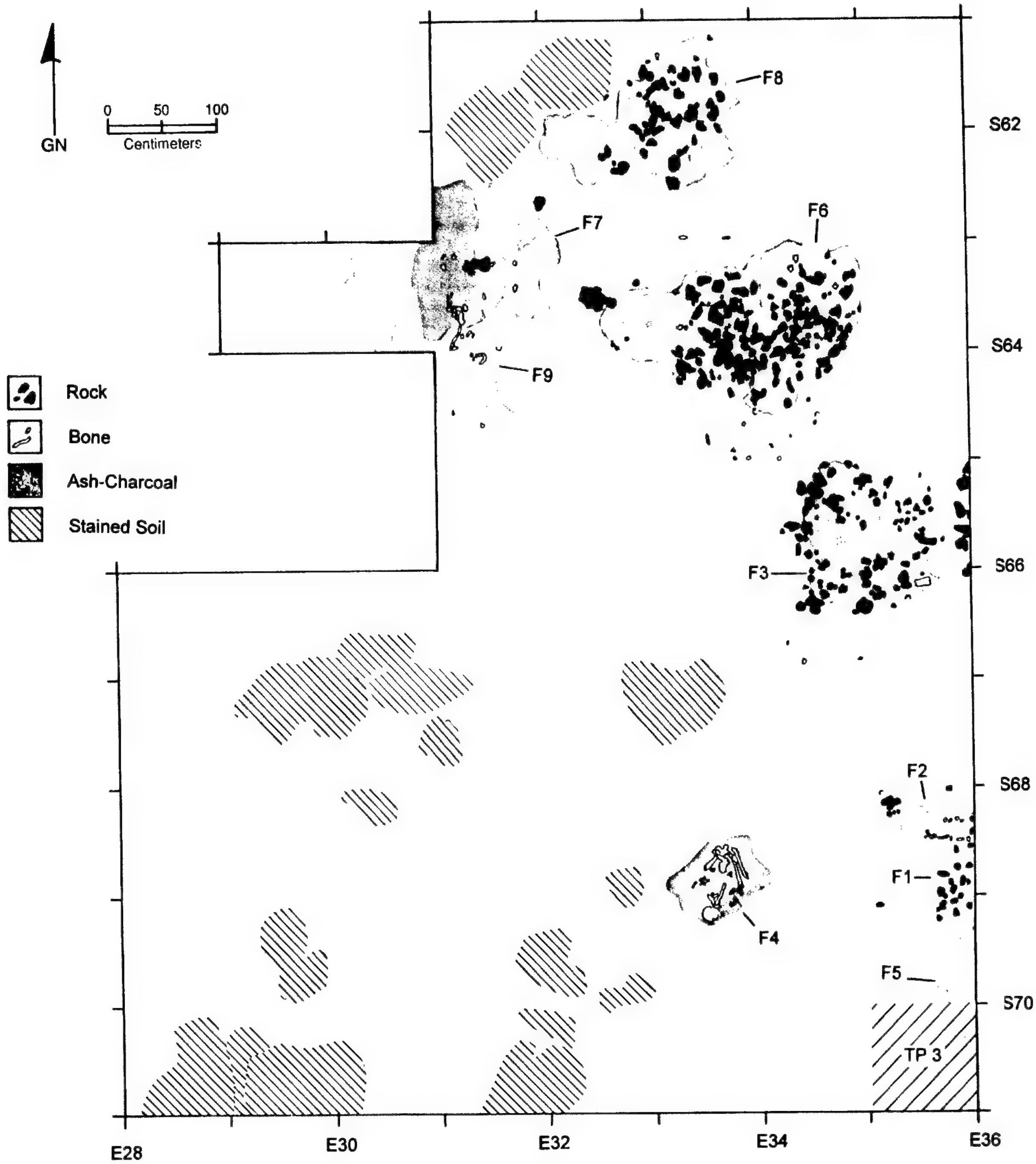


Figure 6.5 Plan of Features in Block 1, 41DN26.

Radiocarbon Dates

Two radiocarbon dates were obtained from scattered flecks of charcoal. The first sample was recovered from level 5 in Unit 74 (E35 S66). It yielded an uncorrected age of 620±60 BP (Beta-32533). Using the curve of Stuiver and Becker (1987) this age correlates with corrected ages of 635, 581, and 564 BP. The

Table 6.1 Provenience and Attributes of Features at 41DN26, Block 1

Feature	Type	Levels	Elevation (cm bd)	Size (cm)	Age*
1	hearth	3	234-240	60x130	2
2	bison bones	5	248-259	20x 50	2
3	hearth	5-6	251-280	130x140	2
4	burial	7-8	276-290	77x 95	2
5	pit	8-10	289-311	120x 40+	1
6	hearth cleaning	4-9	248-293	140x170	2
7	hearth cleaning	6-7	262-277	100x130	2
8	hearth cleaning	7-9	277-300	120x130	2
9	burial	9-11	297-320	50x100	1

* 1 = Late Archaic/Late Pre. I? 2= Late Pre. II

second radiocarbon age was determined on a charcoal sample from level 10 in Unit 68 (E34 S65). This yielded an uncorrected age of 480±70 BP (Beta-32534). Using Stuiver and Becker (1987) this yields a corrected age of 521 ± 70 BP.

Despite their vertical separation, these two ages overlap easily at one sigma, between roughly 520-580 years before present. This age assignment is concordant with the evidence for major occupations at the site during the Late Prehistoric II period, when a variety of arrow points are associated with Nocona Plain ceramics. The apparent discrepancy in stratigraphic positioning must be considered in light of the bioturbation at the site, as well as the association of these samples with Features 3 and 6. The latter is a large pit-like feature that extended from levels 4 through 9.

These ages are complimented by ages of ca. 525 BP from two sites west of Lewisville in Wise County (Ferring 1993, 1995b). The Dodd Pit Site (41WS10) yielded Nocona ceramics, arrow points, features and Bison bones. At the George King Site in western Wise County, a bison kill with abundant resharpening debris also yielded a radiocarbon age of ca. 525 BP , although no diagnostic lithics and no ceramics have been found yet.

Block 1

Artifact Assemblage

A total of 8,805 lithic artifacts were recovered from B 1 excavations (Table 6.2), including both fine and 1/4" screen samples. The tool-core assemblage is dominated by projectile points and unifacial tools (Table 6.3). Together these classes are about five times as frequent as cores or blank-preforms. The great majority of the blank-preforms and cores are made of quartzite; further, very few of the blanks are of arrowpoint size, suggesting that they may be relicts of Archaic occupations of the site, or that the blanks may have been scavenged, as may pertain to many of the dart points as well. Overall, however, the frequency of cores and blanks is very low.

Debitage is dominated by quartzite (Table 6.4). Chert appears to be slightly more common in the lower and upper levels, but these differences are quite small, and the lower levels have very small samples. There is a slight increase in cortical pieces in the upper levels, but there is no corresponding increase in the frequency of cores or blanks in those levels. Small debitage accounts for roughly 65% of all the samples.

Table 6.2 Assemblage Composition, DN26, Block 1

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	GRND ST	TOTAL
1	8						8
2	144			4			148
3	353		1	9	19	2	384
4	995	2	12	16	25	1	1051
5	1304	2	4	14	33		1357
6	1566		3	10	26	4	1609
7	1448	2	8	8	29	4	1499
8	1254	2	3	10	13	2	1284
9	749	2	1	2	7		761
10	434		3	3	8		448
11	206						206
12	53				1		54
13	26						26
14	20						20
TOTAL	8560	10	35	76	161	13	8855
PCT	96.67	0.11	0.40	0.86	1.82	0.15	

The tools assemblage from the site is quite diverse (Table 6.3). Simple retouched pieces are predominant, yet scrapers, gravers and bifacial knives are well represented in the middle levels. The knives are all made of a distinctive granular white quartzite; these include simple bifacial knives and one that has been bilaterally bevelled.

The stratigraphic and spatial co-occurrence of a variety of dart/spear point types with arrowpoints suggests several scenarios. First, the deposits at the site have been thoroughly mixed by bioturbation and other agents which has resulted in the mixing of Late Archaic and Late Prehistoric occupations. Second, the Late Prehistoric occupants, who appear to have inhabited the site at the earlier part of the Late Prehistoric II period based on radiocarbon dates, manufactured a variety of arrowpoint types that are characteristic of both the Late Prehistoric I and II periods (transitional) and continued to manufacture what are classified as mostly stemmed dart/spear points which are mostly of the Gary type. These larger, so-called points, may have actually functioned as knives.

Groundstone artifacts include several hammerstones, a grooved sandstone abrader and simple metates (Table 6.3). The grinding stones suggest plant and/or animal food preparation. The high frequency of unidentified bone (see below) suggests some of these tools may have been used in bone processing such as extraction of marrow and bone grease.

The projectile point assemblage is seemingly dominated by dart points, yet this may not be the case (Table 6.5). The great majority (86%) of the dart points are of "indeterminate" form. These are mixed between blade and tip fragments, as well as common rounded stem fragments from Gary-type points. Gary points dominate the identifiable forms (eg., Figure 6.6 h-j, m, p). The association of Gary points with Late Prehistoric

Table 6.3 Tools and Cores. DN26. Block 1

CLASS/type	LEVEL 2	3	4	5	6	7	8	9	10	11
UNIFACIAL TOOLS										
Retouch	-/2	4/2	7/3	5/1	2/3	4/2	2/3	1/1	1/1	
Ret blade		1/1	-/1							
End scraper				-/2	-/1	1/1			-/1	
Thumbnail scr				1/1			2/-			
Side scraper	-/2			1/-	-/1					
Burin							1/-			
Borer			-/1		1/-					
Graver		1/-	1/2		-/1		1/1			
Unifacial knife				1/-						
Bifacial knife			-/1	-/2	-/1					
Total	4	9	16	14	10	8	10	2	3	
% Chert	0	67	50	57	30	63	60	50	33	
BIFACE FRAG		1	6		6	7	5	3		
% Chert		0	67		33	29	20	67		
BLANK-PREFORM		1	12	4	3	8	3	1	3	
% Chert		0	17	25	33	0	0	0	33	
CORES										
Single plat							-/1			
Multiple plat							-/1			
Bipolar			2/-	2/-						
Core fragment						-/2		-/2		
Total			2	2		2	2	2		
% Chert			100	100		0	0	0		
GROUND STONE										
Unprep metate			1		1	1				
Grooved abrader										
Hammerstone		2			3	3	2			1

/ = chert/quartzite

assemblages has long troubled archaeologists in this region. Good associations of Gary points with Scallorn, Bonham-Alba and Catahoula forms have been dated to ca. 850-900 yr bp at Lake Ray Roberts (Ferring and

Table 6.4 Debitage, DN26, Block 1

LEVEL	QUARTZITE SMALL INT	QUARTZITE SMALL CTX	QUARTZITE LARGE INT	QUARTZITE LARGE CTX	CHERT SMALL INT	CHERT SMALL CTX	CHERT LARGE INT	CHERT LARGE CTX	TOTAL	Chert %	Cortex %	Large %
1	3	1	1	3					8	0.00	50.00	50.00
2	19	20	6	13	11	2	5	1	77	24.68	46.75	32.47
3	72	77	41	69	39	14	14	12	338	23.37	50.89	40.24
4	202	89	68	114	65	22	17	14	591	19.97	40.44	36.04
5	193	100	60	114	70	22	20	12	591	20.98	41.96	34.86
6	216	100	95	124	79	15	23	15	667	19.79	38.08	38.53
7	147	80	57	103	71	12	23	17	510	24.12	41.57	39.22
8	116	56	45	73	63	15	13	6	387	25.06	38.76	35.40
9	79	42	25	38	35	8	16	8	251	26.69	38.25	34.66
10	40	28	14	28	16	4	9	4	143	23.08	44.76	38.46
11	14	10	4	10	10	1			49	22.45	42.86	28.57
12	2	1	2	3	3		1		12	33.33	33.33	50.00
13	2	1			1		1		5	40.00	20.00	20.00
14	1			1	1				3	33.33	33.33	33.33

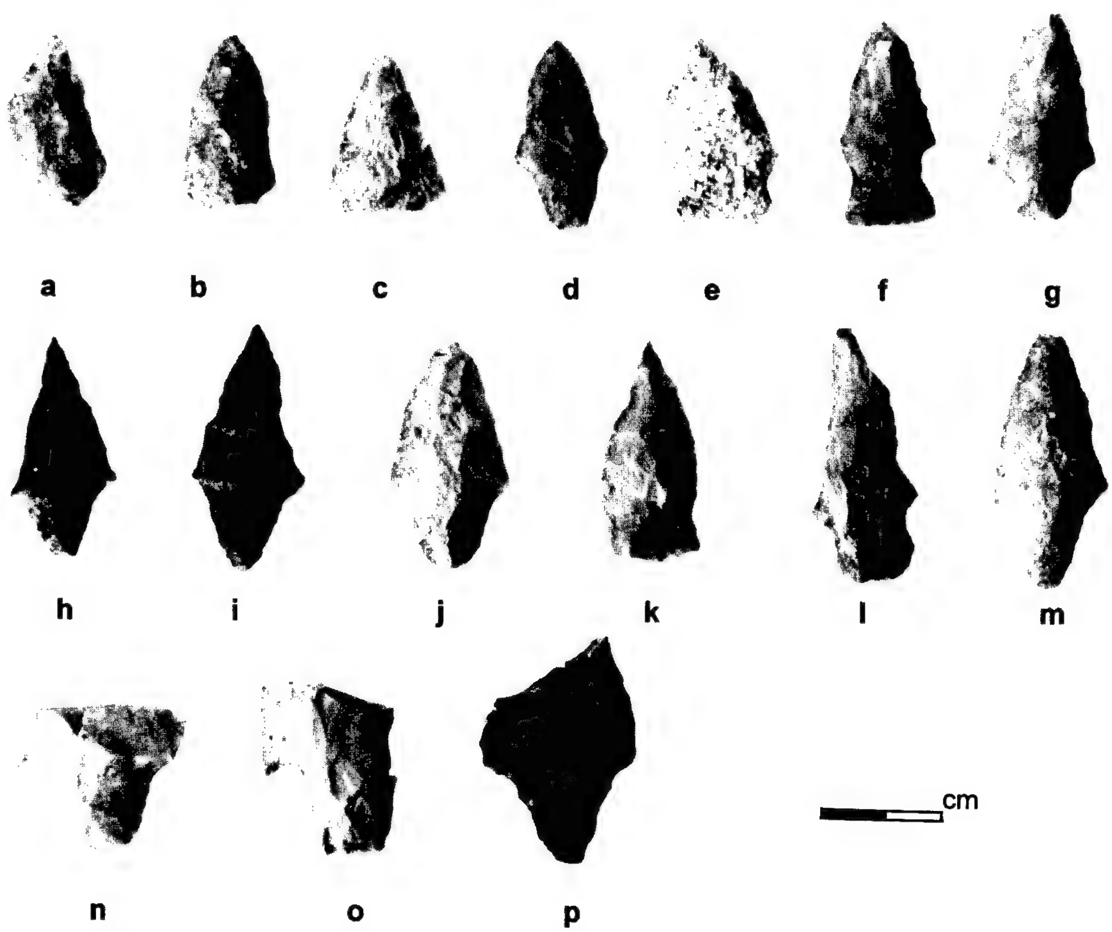


Figure 6.6 Dart points from 41DN26. a (4), b (4), c (6), d (5), e (10), f (9), g (4), h (5), i (7), j (5), k (6), l (12), m (8) , n (6), o (6), p (7) [(x) = level].

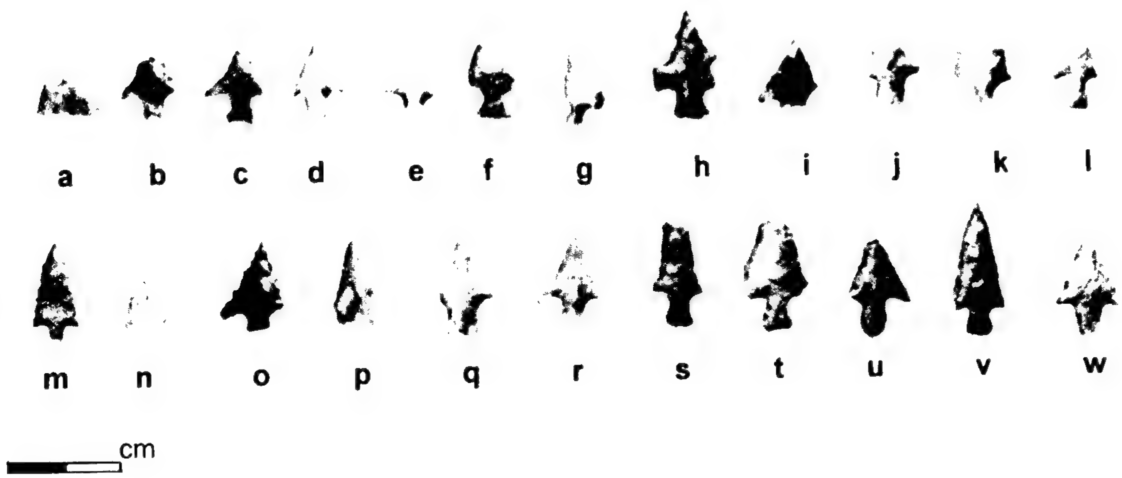


Figure 6.7a Arrow points from 41DN26. a (5), b (5), c (5), d (9), e (9), f (4), g (4), h (6), i (4), j (5), k (3), l (6), m (6), n (7), o (8), p (5), q (7), r (10), s (5), t (10), u (6), v (9), w (3) [(x) = level].

Table 6 5 Projectile Points from DN26 Block 1

	LEVEL								
ARROW PT	3	4	5	6	7	8	9	10	12
Washita			1/-		-/2				
Bonham-Alba	4/1	1/3	-/2	-/2	1/2	1/-	1/1		
Catahoula				2/2	1/2	2/2		1/1	
Fresno	-/1								
Scallorn		1/1	3/2		-/1				
Indet.	3/1	5/1	3/3	2/2	1/3	1/-	1/-	1/-	
TOTAL	10	12	14	10	11	6	3	3	
% Chert	70	58	50	40	27	67	67	67	
DART PT									
Gary		-/1	-/5		-/2	-/1			
Godley		-/1		1/-			-/1		
Marshall					1/-				
Yarborough				1/-					
Carrollton				1/-					
Indet.	7/2	7/6	7/12	8/8	4/14	4/3	2/2	3/2	-/1
TOTAL	9	15	24	19	21	8	5	5	1
% Chert	78	47	29	58	24	50	40	60	0

/ = chert/quartzite

Yates 1997) at Lake Lavon (Lynott 1981). Here, however, it seems quite possible that Gary points (probably among others) were being scavenged and used as blanks for arrow points.

The arrow point assemblage is dominated by Bonham-Alba, Catahoula and Scallorn forms (Table 6.5; Figure 6.7). Upwards from Level 7 through Level 3 there is a regular increase in the use of chert for arrow points; typologically there is a replacement of Catahoula forms with Bonham-Alba over the same interval.

Raw materials for arrowpoints consist mostly of three raw materials that include locally available quartzite, gray chert and tan chert. The gray chert, tan chert, and yellow chert are could include Edwards Plateau varieties from central Texas as well as "regional chert" from areas west of the project area (Ferring and Yates 1997). Much of the buff to tan "regional chert" fluoresces yellow under UV light; Edwards chert exhibits the same property, but comparisons of these have not been systematically undertaken. Regardless, if these materials were not procured as a result of dart point scavenging, then longer distance procurement via exchange or movement is implied. We know the materials were originally procured some distance from the project area, but we do not know much about the full cycling of raw materials after they were brought to the Lewisville Lake area.

Table 6.6 Vertical Provenience of Nocona Plain Sherds at 41DN26

	level	Sherds
	1	-
	2	3
	3	4
	4	35
	5	39
	6	25
	7	23
	8	13
	9	9
total		151

The ceramic assemblage from B 1 consists of a total of 151 sherds of which none occur below level 9 and the majority occurring within levels 4-7 (Table 6.6). For the 151 sherds, 117 (77%) are tempered with crushed mussel shell and 34 (23%) appear to be tempered with a combination of sand and crushed mussel shell. The sand may not be an additive, but rather, may naturally occur in the clay deposits from which they pottery was made. The mussel shell consists of finely crushed shells, much of which has been leached from the paste. The average thickness of the sherds is 7.5 +/- 3 mm.

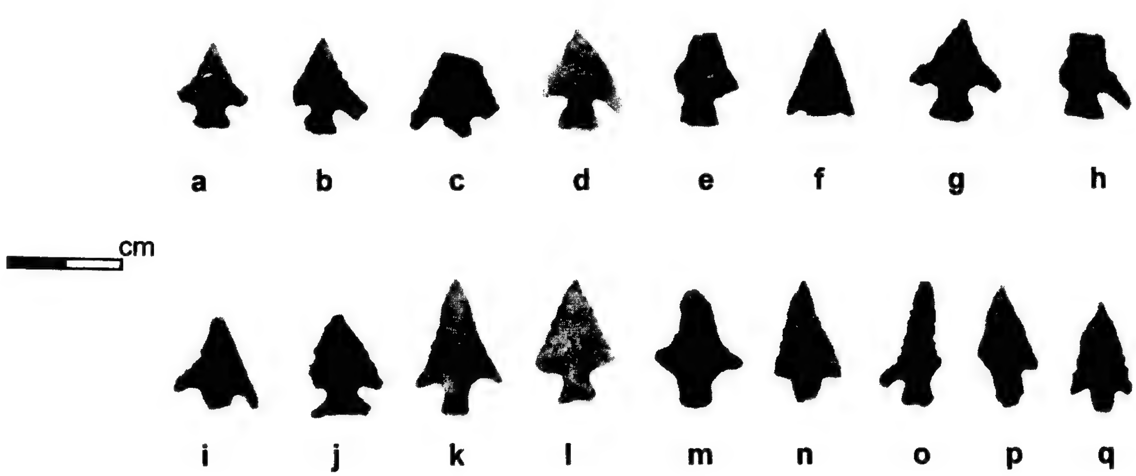


Figure 6.7b Arrow points from 41DN26. a (3), b (10), c (4), d (5) , e (3), f (4), g (6), h (8), i (5), j (5), k (3), l (10), m (7) , n (4), o (8), p (8), q (4) [(x) = level].

All of the sherds have plain, smoothed and/or scraped exteriors and interiors. Only one rim sherd was recovered from level 3 at E 30 S 69. The rim sherd, tempered with crushed mussel shell, appears to be from a vessel with a straight rim. It has a simple rounded lip. The rim sherd is too small to estimate orifice diameter. The pottery is assigned to Nocona Plain ware and is indicative of a Late Prehistoric II occupation.

Faunal Remains

A total of 19,318 fragments of animal bone were recovered from this site. The frequency of bone is depicted in Figure 6.8, showing a bell curve in which 77.7% of the faunal remains come from levels 4 through 8. There is no bimodal distribution to support two distinct occupations based on these data alone, suggesting either a thorough mixing of the diagnostic artifacts or occupation of the site by a transitional group.

The types of animals represented are consistent throughout the levels, except for the absence of fishes in the first three levels. This absence may be attributable to leaching and dissolution of the delicate bones of fishes closer to the surface. Those in the lower levels must have been covered rapidly and deeply to survive until recovery in this sandy substrate. The sandy soil also attracts creatures that are or could be intrusive to the archaeological context such as the nine-banded armadillo, eastern mole, cotton rat, and pocket gopher.

In overall composition, the taxa list (Table 6.7) is very similar to nearby 41DN27. At both sites, deer and bison provided the bulk of the meat protein, and a variety of turtles, birds, and fishes were exploited. And yet there are suggestive differences. For example, there are fewer fur bearers recovered from 41DN26. Also at 41DN26, pronghorn antelope was identified among the large/medium artiodactyl remains, and a badger element was found in level 8. These two animals inhabit dryer habitats than exist in this location today, although Schmidly cites an early pioneer of Waco who encountered pronghorn in McLennan County in early to middle 1800s (Schmidly 1983:313). Badgers prefer prairies with loose, sandy soils and may have only recently returned to Northcentral Texas as a result of late twentieth-century land-clearing activities (Schmidly 1983:266).

At this site, as at others, large mammal bones that could not definitively be assigned to bison were recorded separately. However, since bison was found as close to the surface as 30 cm and as deep as 110 cm, where most of the bones in the cow/bison/elk category were found, bison is the logical assumption for these bones. Taken alone or separately, at least one bison per level is indicated; for the entire site, three individual bison are represented (based on three left distal humeri). Out of a combined total of 227 elements, 41% are identified teeth or tooth fragments. Nevertheless, the entire carcass of these huge animals was represented in the assemblage, including a horn core fragment.

Fifteen of these bovid bones exhibited cut marks, primarily placed in locations indicated by Binford (1981) as typical skinning, dismembering, and filleting marks made by hunter-gatherer groups he studied. Seven per cent of the bison or bison-sized bones at DN27 are burned to some degree.

In a draft report on the excavations at this site, Ken Brown states that two bovid long bones were recovered from Feature 2. These bones were not examined or coded by the team of faunal analysts, and are not reported here. However, a bison phalanx and a mandible fragment were recovered from Feature 7, a hearth-cleaning feature (Appendix B, Table B26.1).

As for deer remains, Figure 6.9 displays the carcass portion distribution for each level and compares these findings with what might be expected from a single carcass. What is important in this diagram is the relative proportion of each carcass part to the others. With the exception of cranial/teeth elements, the carcass fits the expected diagram in relative proportions if not in numbers of elements. Many broken teeth of deer were recovered and tend to skew these results somewhat. For example, 39% of the elements identified as deer were teeth or tooth fragments.

Seven individual deer are estimated for the site as a whole. In levels 7 and 8, there are three individuals each, and in each of the adjacent levels of 6 and 9, there are two individuals represented. Adult and sub-adult

Table 6.7 Faunal Remains from 41DN26, Block 1

	LEVEL												
	1	2	3	4	5	6	7	8	9	10	11	12-15	Total
GAR								1		1			2
BOWFIN											1		1
CATFISH						7		11	3		1		22
DRUM						1							1
BASS/SUNFISH						2	1	1					4
FISH SMALL				1	3	1	3	6	4				18
FISH LARGE					1		1					1	3
INDET. FISH					4	3	4	12	2	1	3	1	30
TOAD/FROG									1				1
MUSK TURTLE				2	1			3					6
MUSK/MUD TURTLE					2	1	2	2		2			9
POND/MAP TURTLE							1						1
SLIDER TURTLE						1	4	3		1			9
BOX TURTLE			2	6	10	18	23	34	18	5	1		117
SOFTSHELL TURT.		1			1		4		1	1			8
INDET. TURTLE	1	10	14	68	85	148	164	197	123	52	21	7	890
NON-VEN. SNAKE					3	9	4	4	1	1	2		24
WATERSNAKE					1								1
INDET. SNAKE				2	2	10	4	10	1				29
LIZARD							1		1	4			6
TURKEY										1			1
COOT/RAIL								1					1
BIRD SMALL							1	1					2
BIRD MEDIUM									1	1			2
ARMADILLO					1								1
MOLE					2		3	2	2				9
COTTONTAIL			1	2	6	5	14	3	5	4			40
JACK RABBIT								1					1
SWAMP/JACK RABT			1					1					2
TREE SQUIRREL										1	1	1	3
POCKET GOPHER				3	1	2	4	8	6		2	1	27
POCKET MOUSE						1		1	1				3
COTTON RAT		1			3	4	4	6	3	1	3		25
VOLE					1	1	1	3			1		7
INDET. RODENT				3	4	3	4	5	6	3	2		30
BADGER								1					1
WHITE-TAILED DEER	1	3	2	31	45	48	80	55	42	29	15	6	357
DEER/PRONGHORN	1	3	7	20	25	56	42	60	35	19	6	1	275
PRONGHORN							1		1				2
COW/BISON/ELK		2	9	14	26	34	26	11	17	3	4		146
BISON		3	12	15	17	14	12	3	5				81
MAMMAL SMALL				1	3	6	2	7	6		9	1	35
MAMMAL MEDIUM					8	13	8	26	10	6	10	4	85
MAMMAL LARGE			2	24	22	14	25	24	11	5	5	1	133
Total	3	23	50	192	277	402	443	503	306	141	87	24	2451

ages are indicated by tooth wear and epiphyseal closure, but no fawns were noted. The absence of neonates or young juveniles suggests a seasonal occupation of the site in the cool months of fall and/or winter.

Evidence of modification of the deer bones comes in the form of burning and butchery marks. About 22% of the deer remains are burned, and of these all body parts are represented; however, there appear to be more phalanges and podials in this category that have been subjected to fire. This suggests some disposal of butchering waste by incineration or the use of bone as fuel augmentation. Cut marks occur on all body parts, and are placed in skinning, dismembering, and filleting locations on those elements.

Bone tool remnants or worked bone fragments total 25 pieces. Five are podials and one cervical vertebra of bison size that have grooves cut into the bones. These may be deep, multiple-stroke cuts necessary to disarticulate the feet and neck joints. These specimens come from levels 4 (vertebra), 5 (astragalus, metatarsal), 6 (scaphoid carpal), and 7 (two metapodial fragments). Two specimens identified as deer long bone shafts had this same scoring cuts, and these come from level 1 and level 6).

Awl tips and other polished splinter tools were recovered from level 4 and below, but are especially prevalent in the lowest levels (>8). These tools (17 in all) are exclusively deer-size long bone fragments, except for one worked antler tine.

The high frequency of burned bone correlates with the occurrence of several large features that are attributed to fire-related activities. Stratigraphically, the upper levels tend to have less identified bone (Figure 6.10) than the lower levels. This trend may be attributed to cultural, or temporal, differences in bone processing efficiency, or it may also be attributed to bioturbation processes which may have also affected the vertical distribution of debitage based on size.

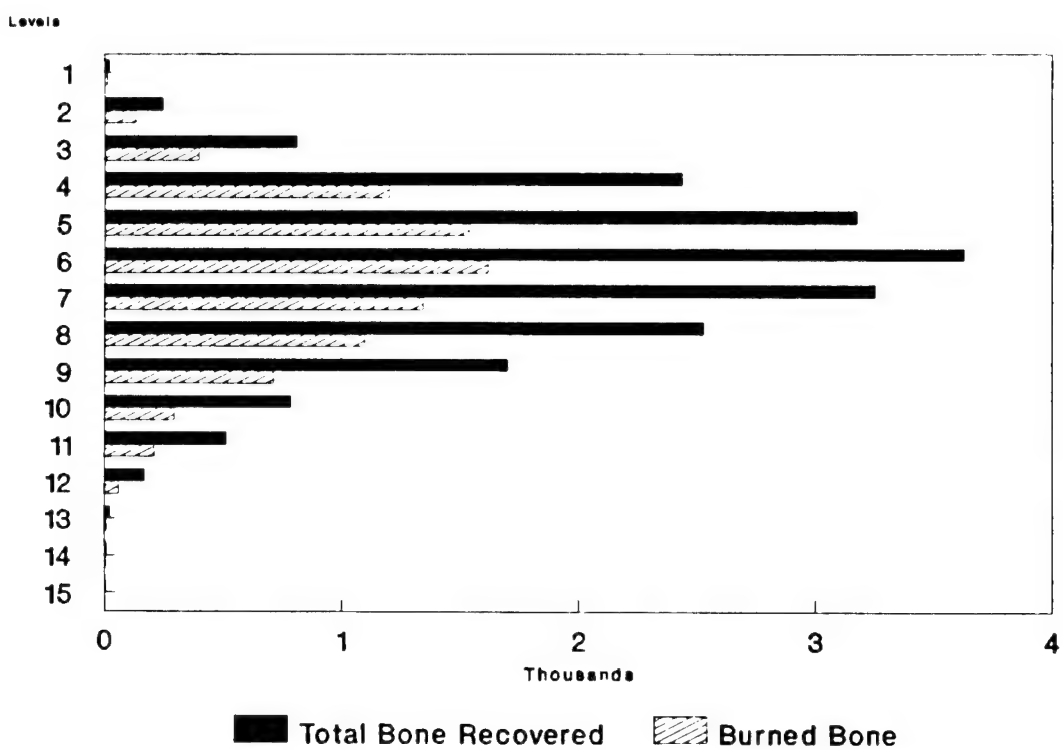


Figure 6.8 Stratigraphic distribution of faunal remains at 41DN26, Block 1.

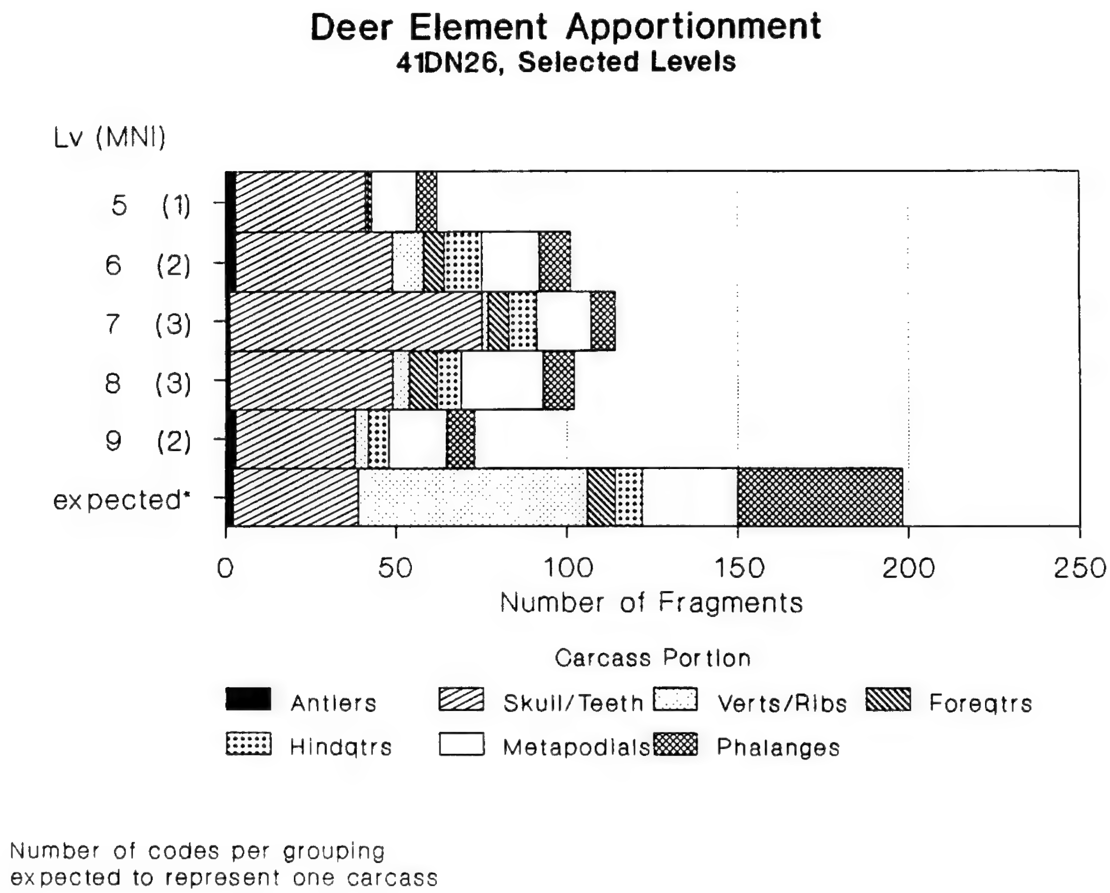


Figure 6.9 Deer Elements from 41DN26, Block 1.

Stratigraphically, there is a tendency for higher relative percentage of unidentified bone to be burned in the uppermost levels, specifically levels 1-5. It is within these levels that the tops of features 1, 2, 3, and 6 occur. Of these, features 1, 3, and 6 are fire-related. Features 1 and 3 are quite large and would account for the high frequency of burned bone. Overall, the low frequency of identified bone (13%) may be attributed to a high efficiency in bone processing that resulted in fragmenting and burning the bone. Such processing would most likely have involved removal of marrow and acquiring bone grease through boiling. Since the Late Prehistoric II inhabitants of the site had pottery vessels, greater efficiency in bone processing would have been possible.

A small quantity of mussel shell was recovered (0.5 kg) from B 1. Most mussel shell was highly fragmented and occurred in levels 4-9 (Table 6.8). A total of 84 hinges, of which 42 are right and 42 are left, were recovered from B 1. Freshwater mussels are believed, by some researchers (Lyman 1984), to represent "starvation" food in environments where other suitable food resources are scarce. The low frequency and fragmented condition of the mussel shell, in association with shell-tempered pottery, suggests it was only used as a food supplement and the shells used for the manufacture of pottery vessels.

A large quantity (161.7 kg) of FCR (Table 6.8) was recovered with most occurring in levels 4-9 which contained all of the features associated with fire-related activities. It should be noted that it is within these same levels that most of the faunal remains, stone artifacts, and pottery occurred. The consistent vertical occurrence of these various categories of artifacts suggests bioturbation may not have played a significant part in the vertical distribution of certain sizes of debitage and bone.

Table 6.8 Artifact Densities. DN26, Block 1

LEVEL	debden (n/m3)	toolden (n/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	% burned bone
1	26.7	0.0	0.0	0	63.3	56
2	55.0	2.9	6.2	228	175.7	55
3	105.6	3.4	1.8	4250	254.1	50
4	105.5	6.4	14.3	3915	435.4	51
5	95.3	3.2	9.1	4656	512.3	50
6	113.1	3.2	10.9	5714	614.9	45
7	89.5	4.6	17.9	7333	580.7	43
8	74.4	3.8	17.4	3623	486.3	44
9	66.1	2.1	17.3	574	451.8	42
10	51.1	2.1	15.1	244	282.5	38
11	40.8	0.0	4.8	100	430.8	42
12	20.0	0.0	0.0	613	285.0	33
13	25.0	0.0	0.0	0	120.0	42
14	15.0	0.0	0.0	40	30.0	100
Mean	92.8	3.8	12.7	4295	476.5	44
Std Dev	29.6	1.9	6.4	2432	118.7	5

It is within levels 6 and 8 that most of the features were recognized. Both of these levels probably represent Late Prehistoric II occupations based on diagnostic artifacts and radiocarbon dates. The lowermost levels, 10-12, which may represent a Late Archaic component. are not examined spatially because of the paucity of cultural remains and absence of features with the exception of human remains (Features 4 and 9). These features occur either on or within crevices of the underlying Woodbine Sandstone bedrock.

For all artifact categories, artifacts tend to occur in the immediate vicinity of the features associated with fire-related activities. While the FCR tends to be associated within the spatial limits of the features, stone tools, projectile points, pottery, and shell tend to occur in greatest frequency around the periphery of the features. This would suggests that the loci of fire-related activities were the center of most all other activities that included stone tool manufacture, maintenance, and discard. Feature 4, a human interment, appears to be spatially isolated from most other features and associated activities. However, two human mandibles (Feature 9) occurred adjacent to the features with fire-related activities (Figure 6.5).

Also of importance in examining the spatial distributions of artifacts is the presence of several large stone concretions within the limits of B 1 (Figure 6.5). The largest of these boulders occurred in the southwest corner and the central portion of the southern half of the block. The occurrence of a relatively large number of artifacts around these boulders, particularly in level 6 suggests they may have been used in the performing of certain tasks such as anvils in the manufacture of chipped stone tools. The larger one, in the southwest corner of the block, would also have made an ideal seat to perform certain tasks. At the least, these boulders constrained to some extent use of space in this portion of the site as well as the burial potentials for occupation refuse.

Summary

Based on diagnostic projectile points and ceramics, Late Archaic, Late Prehistoric I, and Late Prehistoric II period occupations took place at 41DN26. The two radiocarbon ages place the Late Prehistoric II occupation at the beginning or first half of that period, and it is quite likely that "transitional" LP I-II occupations may be represented as well. Almost certainly the site was occupied repeatedly, making definition of any "discrete" assemblages impossible. The occurrence of dart/spear points throughout the excavation levels can be accounted for in part by the continued manufacture and use of certain styles, particularly Gary-like, for purposes of both projectile points and hafted knives. Also, the sandy deposits are conducive to a variety of bioturbation processes that would result in probable mixing of Archaic and Late Prehistoric materials. Lastly, scavenging of points for use as blanks for arrow points may well have been an important part of the Late Prehistoric lithic procurement-processing system,.

A probable Late Archaic occupation is present based on the occurrence of dart points and the absence of ceramics in the lowermost levels of B 1. One possible explanation for their occurrence, within the crevices of the Woodbine Sandstone and immediately above this bedrock formation, is that immediately following the Late Archaic occupation, erosion of the deposits may have occurred.

Following this probable period of erosion, deposition occurred during transitional Late Prehistoric I and Late Prehistoric II occupations. Cultural features, faunas and artifacts associated with this series of occupations appear to have been more frequent and/or more intensive than the Late Archaic occupations, recognizing that remains of the latter may have been subject to prolonged weathering and/or erosion.

Activities associated with the Late Prehistoric II occupation include primary and secondary chipped stone tool manufacturing, use of pottery vessels (most likely for food preparation activities), animal butchering that included the processing of large quantities of both deer and bison, and food preparation and cooking tasks. The highly fractured condition of the faunal remains, in addition to a high frequency of burned bone, suggests intensive bone processing took place. The condition of the faunal assemblage may be accounted for by extraction of bone marrow and grease. The use of ceramic vessels would have greatly facilitated the efficient extraction of bone grease and may also have contributed to the high frequency of burned bone.

There is no evidence that the site's occupants practiced horticulture nor used the site as a semi-permanent or permanent village. Rather, the features and artifacts suggest use of the site, at least in the locus of B 1, as a hunting and gathering camp. A variety of subsistence and maintenance tasks were performed. This included the use of the site as a place for human interment. The one nearly complete adult burial (Feature 4), may be attributed to either a Late Archaic or Late Prehistoric II occupation. The flexed position of the body, and its placement within a depression of the Woodbine Sandstone bedrock, suggests minimal effort was afforded to its interment. The absence of associated grave goods fits the pattern observed with other Late Archaic and Late Prehistoric burials in the Lewisville Lake and Ray Roberts Lake project areas. The two adult human mandibles in Feature 9 are unique in this area as far as can be determined from the literature. Secondary burial seems plausible, if not likely. But the affiliation of these individuals with the site occupants is impossible to ascertain.

Chapter 7 41DN27

Introduction

Site 41DN27 is located at an elevation of 530-540 feet MSL on a sandy colluvial slope south of the Little Elm Creek floodplain (Figures 1.2, 7.1). The setting of the site is very similar to that of 41DN26 (Chapter 6). It is about the same distance from the creek, and formed above eroded and weathered Woodbine sandstone. The sediments at the site are loamy sands to sands which grade down to weathered, friable Cretaceous sandstone. Upslope, above the site, are terrace gravel and clay deposits associated with the Hickory Creek terrace (Ferring 1993). East of the site is the contact of the Woodbine Group sandstones with Eagle Ford clay-marl, coinciding with the East Cross Timbers-Blackland Prairie ecotone.

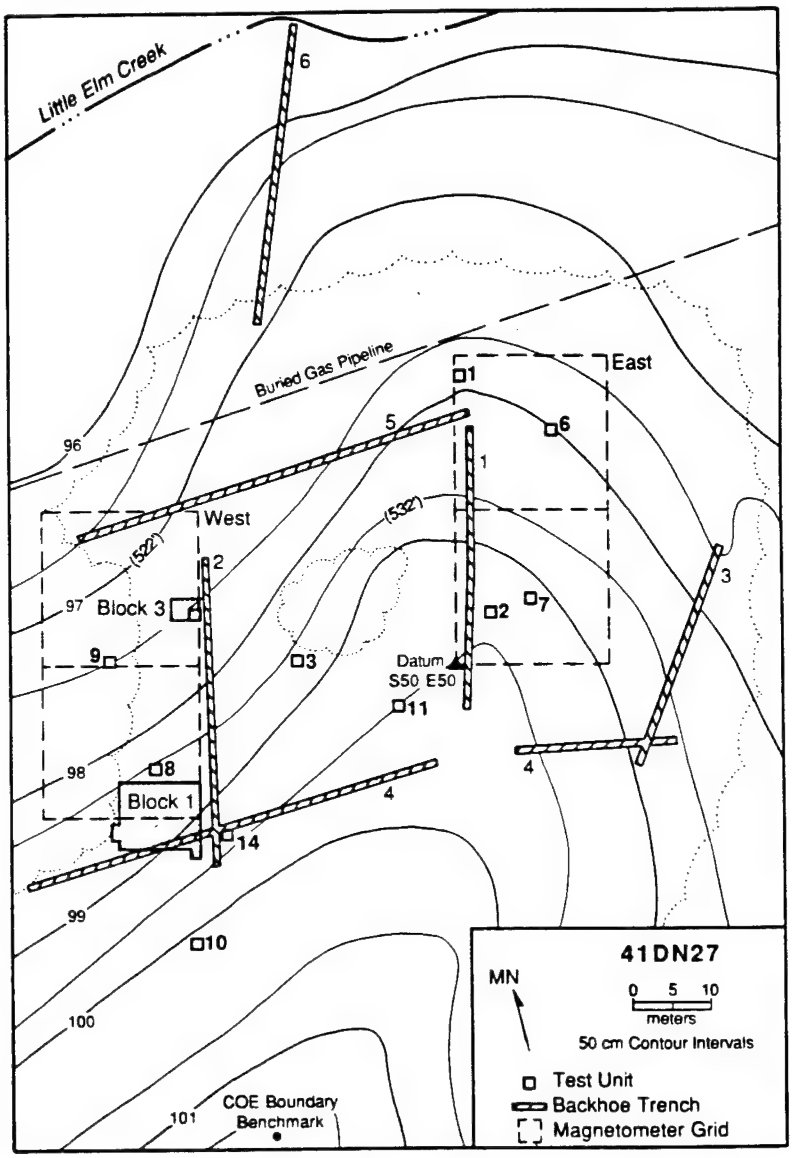


Figure 7.1 Map of site 41DN27. Site formed in colluvium and residual soil of weathered Woodbine sandstone. Note similar context for Site 41DN26.

The entire site area has been plowed, and today is overgrown with secondary trees as well as dense forbs and grasses. The north end of the site has been disturbed by trenching for a high pressure gas pipeline.

Previous Research

Testing in 1988 by UNT consisted of seven BHT's and manual excavation of 10 1x1-m TP's (Figure 7.1). TP's were dug to depths from 30-90 cm below ground surface. Cultural remains recovered included large quantities of lithic artifacts, faunal remains and a few ceramics. The ceramics were almost all shell-tempered and were classified as Nocona Plain ware. Projectile points included Gary, Scallorn, Bonham-Alba, Washita and Fresno types (Brown and Lebo 1990).

Five features were located during testing; three of these were partially excavated. Two of the features were rock-lined hearths and the third was a dark soil stain that contained two human molars. Large quantities of stone tools, ceramics, and fauna were recovered. The well-preserved bone and occurrence of features in primary context indicated the site could yield significant new information about the Late Archaic and Late Prehistoric periods. A proton-magnetometer survey was conducted over two 20x40 m tracts; this survey delineated several areas with subsurface magnetic anomalies that may be attributed to the prehistoric occupation (Brown and Lebo 1990).

Excavation

Excavation in 1988 by UNT included three BHT's, three 1x1 m TP's, a 2x3 m block (B 3), and B 1 which consisted of 93 contiguous 1x1 m units (Figures 7.1,7.2). BHT 13 bisected a large feature immediately north of B 1. This feature, discovered at the end of excavations at the site, was not excavated because of time

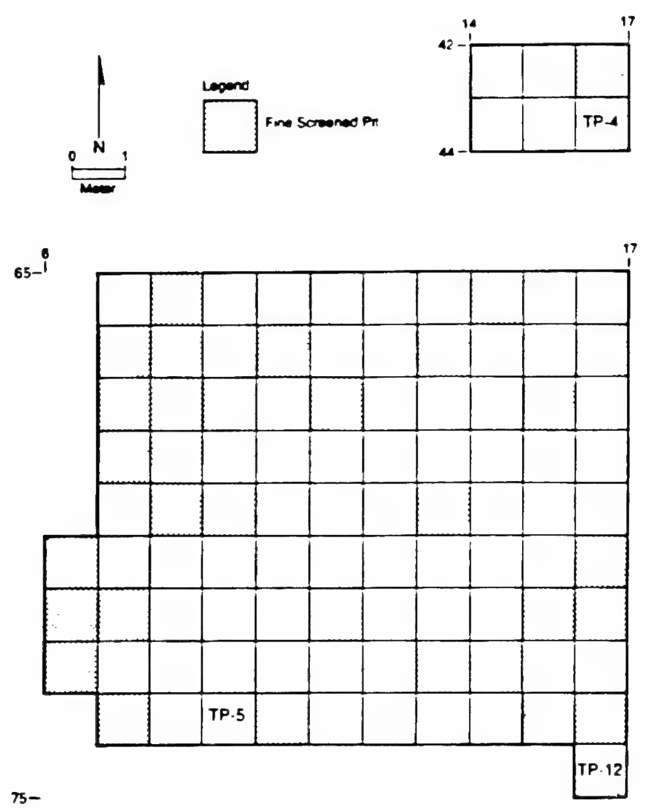


Figure 7.2 Plan of Blocks 1 and 3, 41DN27, with locations of test pits and units that were fine screened.

constraints. B 1 was placed between TP's 5 and 8 and BHT's 2 and 4 because of the quantity and quality of cultural material found during testing. TP 11 was placed at a higher elevation near the center of the site in anticipation of opening a second block, but this was not done because of the extended effort put into B 1. B 3 consisted of a 2x3 m area that incorporated TP 4. This small block was dug in order to acquire a small sample of Archaic period remains. Extension of the BHT's onto the floodplain of Little Elm Creek resulted in finding buried cultural remains in these alluvial sediments. This area, containing buried cultural remains, is located west of the BHT dug onto the floodplain during the testing phase.

In Block 1, up to 14 arbitrary levels were excavated, although because of the slope, the average depth of the excavations below ground surface was 60 cm. Excavations were usually terminated when weathered sandstone was encountered (Figures 7.3,7.4). Sands and loamy sands below the plowzone contained the artifacts and features at the site. These deposits, like those at 41DN26, were bioturbated by animals and by large bullnettle roots. Nonetheless, well-preserved features were found in these deposits. thirty-two of the excavation units were fine-screened to recover microfauna and small debitage (Figure 7.2).

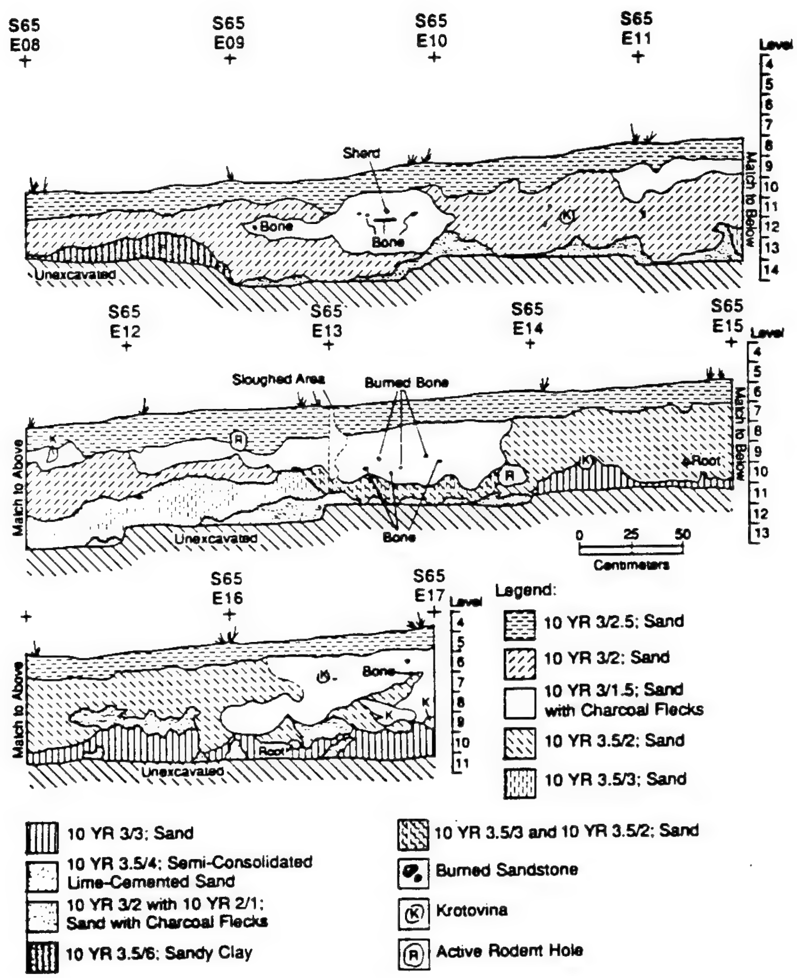


Figure 7.3 North profile of Block 1 at 41DN27. Note weathered bedrock at base of excavations, plow zone at surface and slope of section.

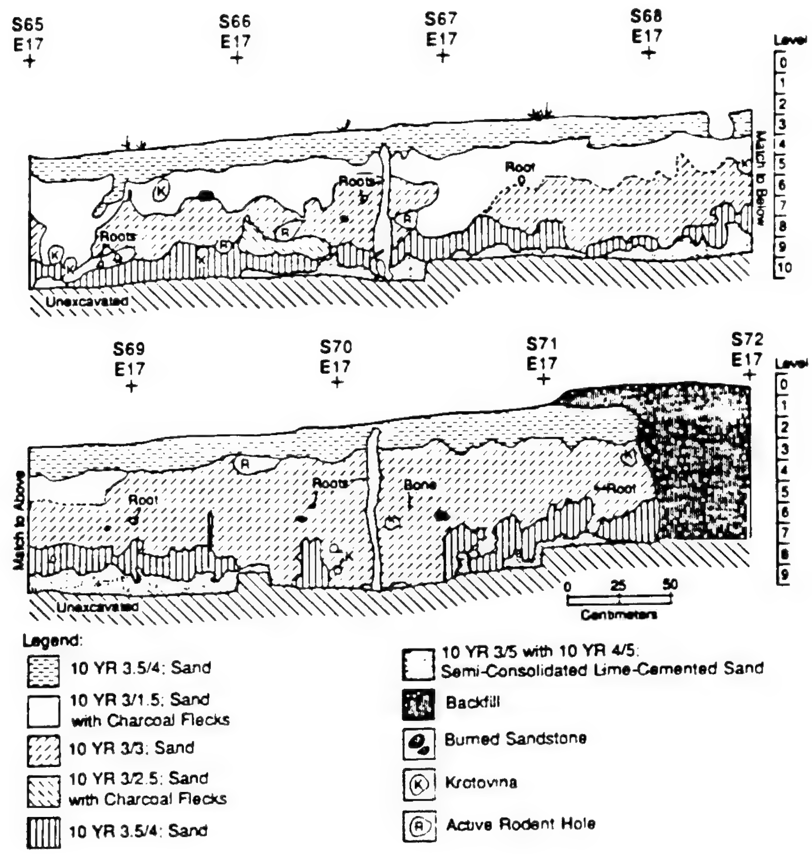


Figure 7.4 East profile of Block 1 at 41DN27

Block 1 Features

Twelve features were delineated in B 1 (Figure 7.5). Of the 12 features, at least five functional types are recognized with the majority believed to be associated with fire-related activities (Features 1, 3, 4, 5, 6, 9, 11, and 14). The other four features represent a shell refuse heap (Feature 10), a bison bone refuse pit (Feature 2), a hearth/refuse scatter (Feature 12), and a human interment (Feature 7). Features are discussed according to their probable function. Table 7.1 shows the size, provenience and probable cultural affiliation of the features. Features labeled with TP are from testing (Brown and Lebo 1990).

The probable hearths, Features 1, 3, 4, 5, 6, 9, 11, and 14, are characterized by soil stains, clusters of FCR, bone, charcoal, ash and some with burned earth. Feature 1, contained within excavation levels 5-8, measured 140-150 cm. A complete metate that was placed face-down, was associated with the feature. Feature 3, within levels 5-6, measured approximately 60x80 cm. Feature 4, within level 7, measured 90x130 cm and had one pottery sherd associated with it. This feature may represent hearth cleaning debris. Feature 5, within levels 5-7 (14 cm thick), measured 50x50 cm. Feature 6, within levels 9-10, was a cluster of FCR that measured 25x40 cm. Feature 9, within levels 10-13, had burned earth and shell associated with it. It measured approximately 80x65 cm. Feature 11, within level 11, measured approximately 120x100 cm and contained shell and burned earth. Feature 14, within levels 13-14 (13 cm thick), was a circular pit that contained fragments of bone and burned earth. It was associated with Feature 12, a concentration of refuse. Not all of Feature 14 was excavated since a portion of it extended into the west wall of B 1. The excavated portion measured 44x35 cm.

Table 7.1 Provenience and Attributes of Features at 41DN27

Feature	Type	Levels	Elevation (cm bd)	Depth (cm bs)	Size (cm)	Age*
T1	rock-lined hearth	21-23	430-460	50-80	?	1
T2	rock-lined hearth	7		60-70	?	2
T3	stained soil	6	280-290	20-30	?	2
1	hearth	5-8	271-308	21-58	140x150	2
2	bone filled pit	5-10	278-323	48-93	80x100	2
3	hearth	6-7	281-300	31-50	60x80	2
4	hearth cleaning	7-8	296-303	46-53	90x130	2
5	hearth	5-7	277-292	47-62	50x50	2
6	rock-lined hearth	8-10	309-328	49-68	25x40	2
7	burial pit	10-12	324-344	64-84	62x73	2
8	hearth**	20-21	420-438	50-68	50x70	1
9	hearth	10-13	320-355	60-95	65x80	2
10	shell conc.	7-9	294-315	34-55	35x60	2
11	unlined hearth	11-12	330-348	40-58	100x120	2
12/13	refuse filled pit	9-13	314-353	54-93	92x215	2
14	refuse scatter	13-14	359-363	79-83	35x44	2

* 1 = Late Archaic 2= Late Pre. II
** in Block 3; all others in BI

Feature 10 was a concentration of freshwater mussel shell that occurred within levels 7-9 (28 cm thick) and measured approximately 35x60 cm. A few pieces of charcoal, bone fragments, and one pottery sherd were associated with it.

Feature 12 was originally divided into two features, 12 and 13. However, with complete exposure of these stains it was realized that a single large concentration of occupational refuse was present. This feature consisted of a dark soil stain with associated bone, shell, charcoal, FCR, and pottery sherds. It occurred within levels 9-14 (63 cm thick) and measured 95x215 cm. It appears to be a single-use refuse pit.

Feature 7, a human interment, occurred within levels 10-12 (19.5 cm thick). The primary burial was placed in its left side in a tightly flexed position, with the head facing southwest. A prepared burial pit, measuring 73x62 cm, had been dug down to bedrock.

Feature 2, an unusual bison bone refuse pit, measured approximately 80x100 cm in diameter and was first observed at a depth of 48 cm below ground surface, or within excavation level 5 at 278 cm below site datum. The upper part of the pit had portions of two bison calf skulls at the top of its fill (Figure 7.6a). Excavation of the feature revealed a continuous fill of bison skeletal remains representing skull, vertebral, rib, and limb elements (Figure 7.6b; see discussion below). The pit had straight walls and a flat bottom. At the bottom of the pit were 9 bison scapula laid out to purposefully cover the floor of the pit (Figures 7.6c, 7.7). The 9 scapula represent a minimum of 6 individuals. Also occurring around the perimeter of the feature's bottom were several large rock boulders/cobbles. Several of these appeared to have been burned prior to placement in the bison bone pit. The bottom of the feature extended approximately 10 cm into the underlying Woodbine Sandstone bedrock.

There are several possible scenarios regarding the purpose or function of Feature 2. First, the feature may represent a simple refuse pit for the disposal of bison bones. Several facts tend not to support this interpretation. These include the intentional digging of the feature 10 cm into sandstone bedrock, which would have required substantial effort on the part of the occupants. Also, the layout of the rocks and bison scapulae

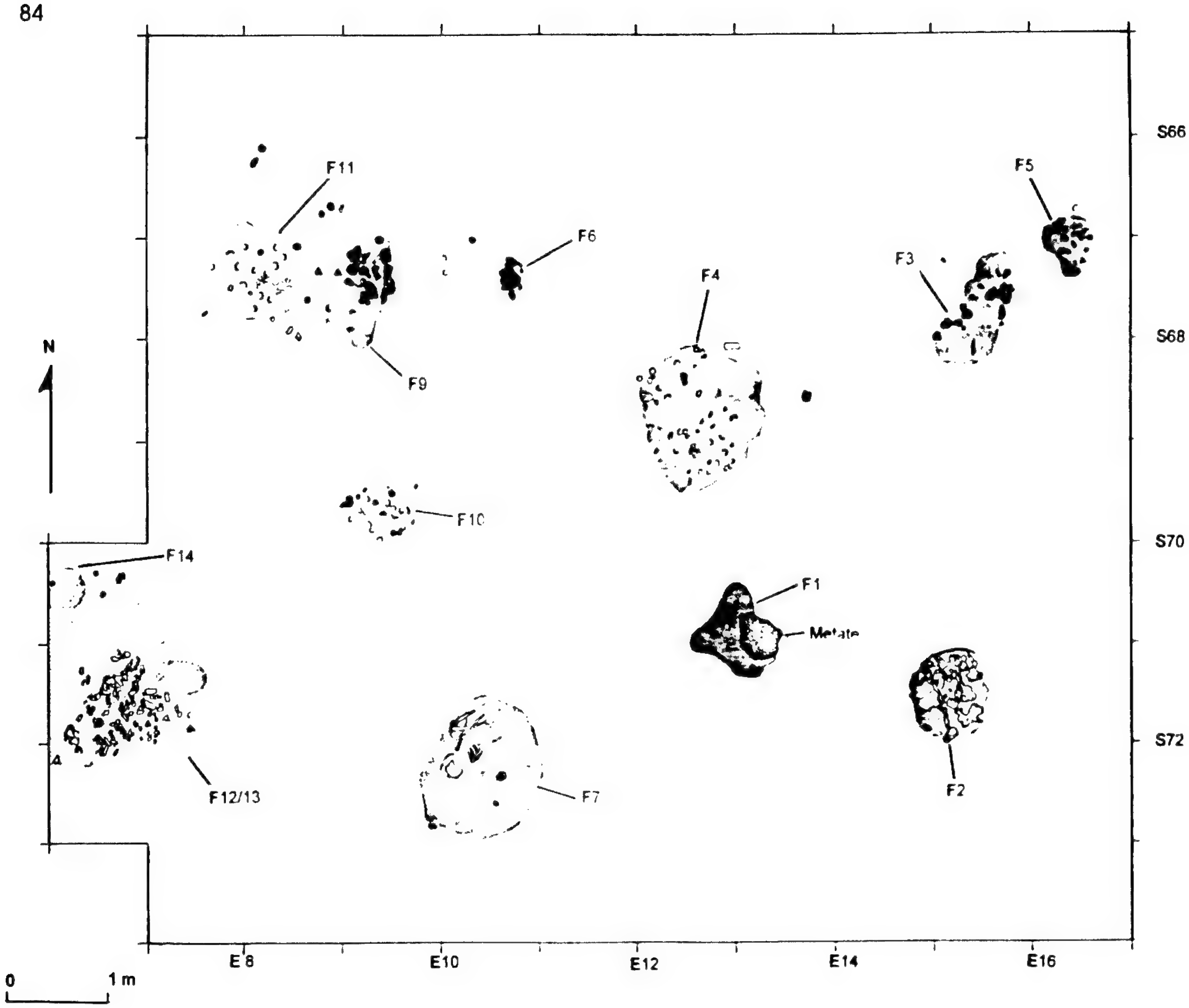


Figure 7.5 Plan of features at 41DN27, Block 1.

on the floor of the pit were not placed haphazardly, but rather in a prescribed manner to form a floor. The only evidence to support the function of Feature 2 as a simple refuse pit is the occurrence of haphazardly placed bison skeletal elements within the interior.

Another purpose of Feature 2 may have been as a cache for larger bone to be processed and/or used at a later time. This notion is discussed in the faunal section below. To our knowledge, however, this kind of feature is unique in the region, if not the Southern Plains.

Block 3 Features

Feature 8, a hearth, was the only feature located within B 3. It was only partially excavated since it extended into the west and south walls of the block. The excavated portion measured 50x70 cm, with the complete feature measuring substantially greater than that. The hearth, located within excavation levels 19-21, consisted of a concentration of FCR and a slight soil stain.

a

b

c

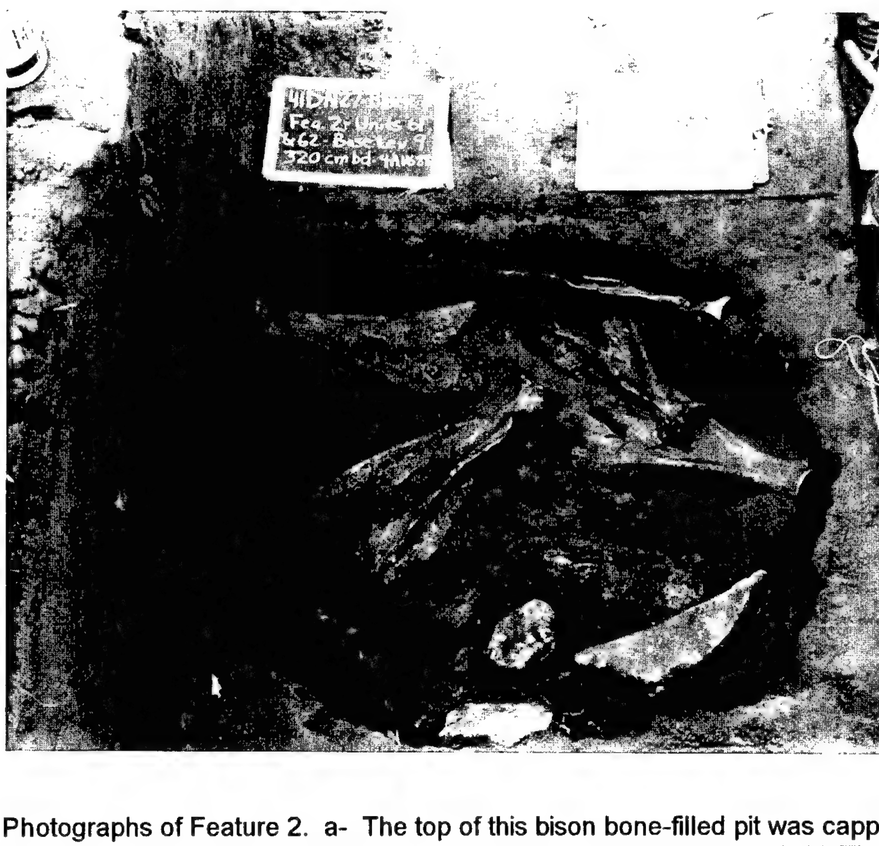


Figure 7.6 Photographs of Feature 2. a- The top of this bison bone-filled pit was capped with two calf skulls, the only immature bones of the minimum nine individuals represented in the pit fill. The pit had vertical walls, and was approximately 60 cm deep. b- The middle part of Feature 2 was filled with bison post-cranial bones. Many of the long bones were charred and had radial fractures, suggesting marrow extraction. c- The base of the pit was excavated 10 cm into bedrock. Nine bison scapulae, representing at least six animals, were carefully placed on the floor of the pit, along with ten large cobbles (see Figure 7.7).

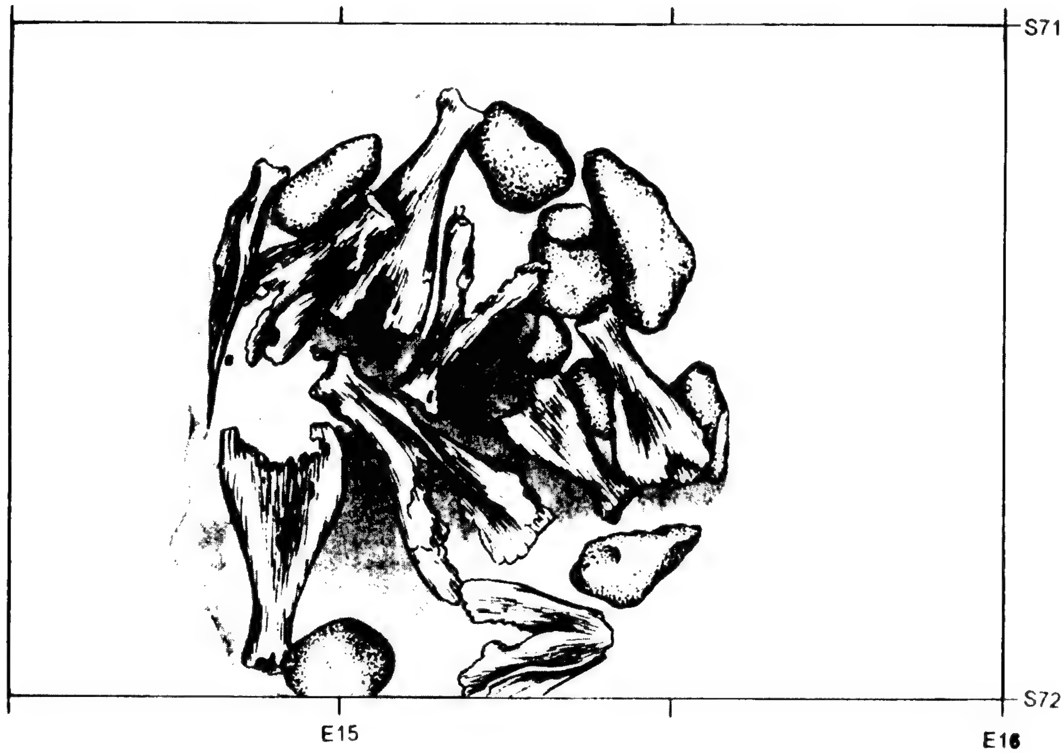


Figure 7.7 Bison scapulae and cobbles at the base of Feature 2, 41DN27

Radiocarbon Dates

Two radiocarbon dates were obtained from scattered flecks of charcoal from two discrete areas of B 1. One sample was taken from level 11 in Feature 12, located in Unit 90 (E7 S72). This sample yielded an uncorrected age of 500$\pm$80 BP (Beta-32536), and a corrected age of 528 $\pm$80 bp (Stuiver and Becker 1987). The second sample was taken from level 11 of Unit 19 (E9 S68). This sample yielded an uncorrected age of 680$\pm$90 BP (Beta-32535), and a corrected age of 668 $\pm$90 bp (Stuiver and Becker 1987). These ages place the later occupation at the beginning or first half of the Late Prehistoric II period, according to the chronology presented by Prikryl (1990). This occupation is essentially contemporaneous with the one at site 41DN26, located less than one kilometer to the west. No radiocarbon dates were obtained for the possible Late Archaic component.

Test Pits

The artifact assemblage from TP's come from two 1x1 m units. One unit, located at E 43 S 56, was originally designated B 2. However, because of its location on ground above the proposed new lake level, and the continued expansion of excavations in B 1, the block was never opened. The other TP is located at E 21 S 73, immediately east of B 1. Cultural materials recovered from these two TP's are listed in Appendix A (Table A27.1).

Dart/spear point types recovered from the TP's (Table A27.1) include Gary and Elam types. These types are indicative are possible Late Archaic components. Arrowpoint types include Fresno types. These arrowpoint types are indicative of Late Prehistoric II components.

Raw material types for dart/spear points from the TP's are mostly locally available quartzites (80%) followed by gray chert. The gray chert is possibly an Edwards Plateau variety from central Texas, or a material available from gravels to the west of the project area (Banks 1990). Of the three arrowpoints, two are of locally available quartzite and one is made of a white opaque chert.

Block 1

Over 25,000 lithic artifacts were recovered from Block 1 (Table 7.2). In the non-debitage classes, cores and blank-preforms have moderately high frequencies. While projectile points dominate the assemblage, the combined frequency of unifacial tools and ground stone tools is almost as high as that of points. Among the tool classes, simple retouched pieces clearly dominate samples from each level (Table 7.3). End scrapers are the next most common tool type, although these are only common in levels 6-9. Notably, there are no drills or thumbnail scrapers in the assemblage. A few gravers, a gouge and a flaked hematite celt round out the sample. Use of chert is dominant throughout the levels, but chert frequencies are highest in the uppermost levels. Quartzite dominates the biface fragments, which, as at 41DN26, are mostly dart point fragments. These may represent scavenged pieces that were used for arrow point blanks.

Table 7.2 Assemblage Composition, 41DN27, Block 1

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	GRND ST	TOTAL
1	142	0	0	0	0	1	143
2	251	1	1	5	0	3	261
3	734	0	1	4	8	1	748
4	1352	0	3	5	19	7	1386
5	1579	7	9	12	9	1	1617
6	2003	2	10	10	23	2	2050
7	2834	3	6	17	29	6	2895
8	3373	3	9	18	26	3	3432
9	3002	4	15	10	25	2	3058
10	3395	1	7	10	15	1	3429
11	3192	2	4	10	11	1	3220
12	2071	0	4	2	0	0	2077
13	925	2	0	5	7	1	940
14	60	0	0	1	0	0	61
TOTAL	24913	25	69	109	172	29	25317
PCT	98.40	0.10	0.27	0.43	0.68	0.11	

Blank preforms are almost all of dart point size; for these, quartzite materials dominate. Quartzite is also most common for the cores (Table 7.3), suggesting that chert implements were imported as finished tools or as flake blanks. However, the frequency of chert debitage clearly increases up through the stratigraphic sequence (Table 7.4), suggesting greater use of cherts by some means of import and processing. At the same time, small debitage becomes more common, suggesting that either tool maintenance tasks or tool/flake blank import became more important through time.

Ground stone tools recovered from Block 1 (Table 7.3) are quite diverse, including manos, metates and a grooved sandstone abrader. A hematite celt, rectangular in profile and ground over its entire surface, was found in level 9. Ogallala quartzite hammerstones were found throughout the stratigraphic sequence.

Table 7.3 Tools and Cores DN27. Block 1

CLASS/type	LEVEL												
	2	3	4	5	6	7	8	9	10	11	12	13	14
UNIFACIAL TOOLS													
Retouch	5/-	4/-	3/2	6/4	5/4	8/7	10/4	5/2	6/4	8/1	-/1	2/2	-/1
End scraper				-/1	-/1	-/1	-/2	1/1				-/1	
Side scraper				1/-									
Burin							1/-						
Gouge								-/1					
Graver						1/-	-/1				1/-		
Flaked celt										-/1			
Total	5	4	5	12	10	17	18	10	10	10	2	5	1
% Chert	100	100	60	58	50	47	61	60	60	80	50	40	0
BIFACE FRAG	1	2	4	3	4	9	17	7	10	4	1	1	
% Chert	0	50	25	0	25	22	18	71	20	100	0	0	
BLANK-PRE	1	1	3	9	10	6	9	15	7	4	4		
% Chert	0	0	0	0	30	50	11	25	0	25	25		
CORES													
Single plat	-/1			-/3			-/3	1/-		-/1			
Multiple plat				1/2	1/-	-/1		-/2		-/1		-/2	
Opposed plat								-/1					
Core fragment				-/1	-/1	-/2			-/1				
Total	1			7	2	3	3	4	1	2		2	
% Chert	0			14	50	0	0	50	0	0		0	
GROUND STONE													
Unprepared mano	1		3			1		1					
Prepared mano	1			1								1	
Unprep metate			2		1		1		1		1		
Grooved abrader						1		1					
Hematite celt								1					
Hematite disc		1											
Hammerstone	1		2		1		1	3	2			1	
Total	3	1	7	1	2	2	2	6	3		1	2	

"/" = chert/quartzite

The projectile point assemblage from this site is, from a cultural-stratigraphic perspective, quite difficult to interpret (Table 7.5). Gary and Godley type dart points are common throughout the upper levels of the site (Figures 7.8, 7.9). At the same time, "late" type arrow points, particularly Washita forms, are also common throughout the sequence (Table 7.5; Figure 7.9). These forms co-occur with Bonham-Alba and Catahoula points. Although identified arrow points are usually more common than identified dart points, the dart point fragments add to make dart points the dominant forms in the site. This situation strongly suggests that bioturbation or another mixture agent has played to leave this diverse set of tools in archaeological association.

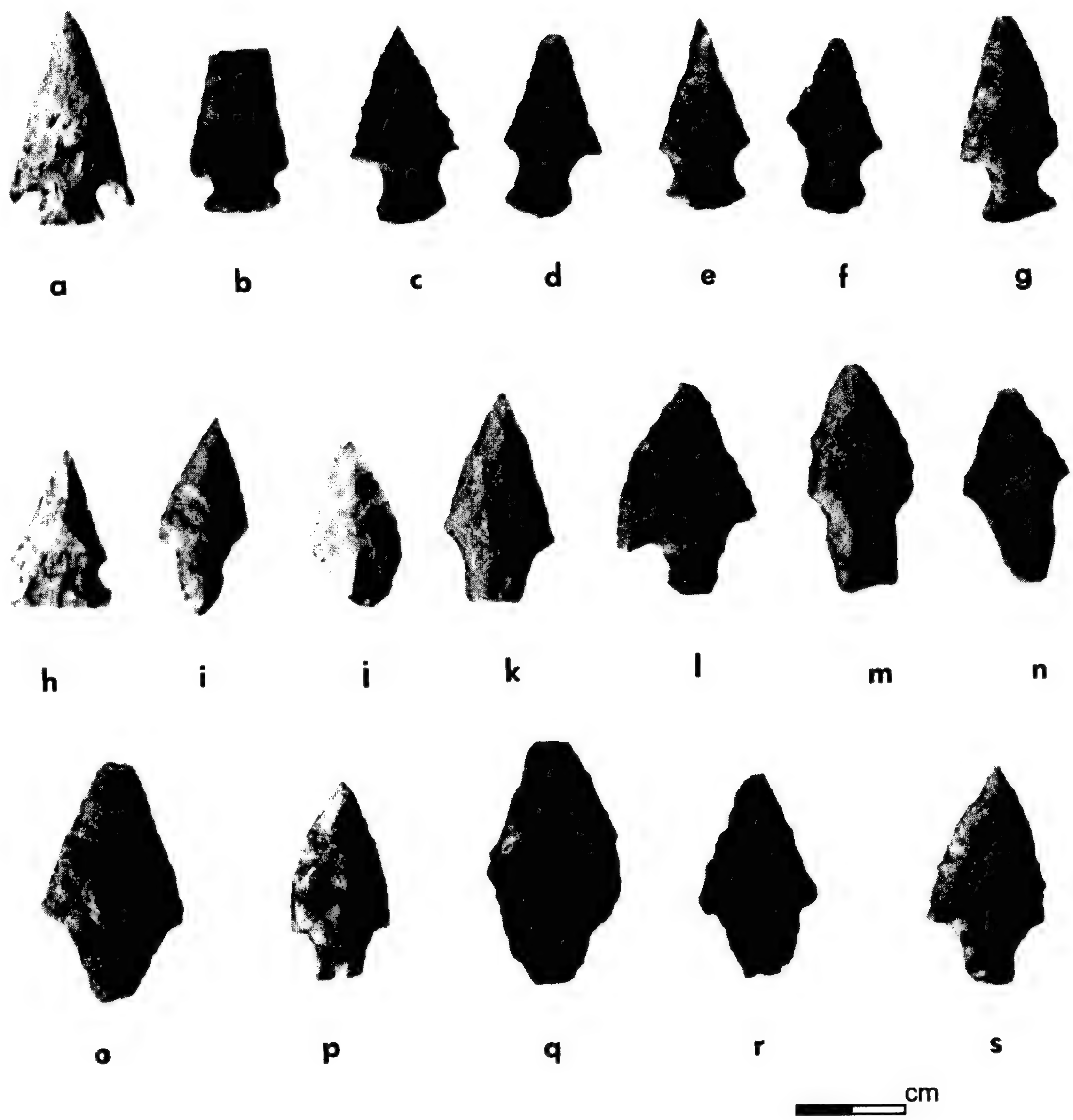


Figure 7.8 Dart points from 41DN27. a (7), b (10), c (9), d (10) , e (1), f (6), g (9), h (10), i (8), j (9), k (4), l (13), m (3/22) , n (9), o (3), p (9), q (3/18), r (TP11/7), s (8) [(x) = level; (x/x) = Block or TP / level].

Table 7.4 Debitage DN27. Block 1

	QUARTZITE				CHERT					INDICES		
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									TOTAL	%	%	%
1	2	3	0	4	5	3	0	0	17	47.06	58.82	23.53
2	10	4	1	6	7	1	0	1	30	30.00	40.00	26.67
3	55	37	9	29	45	14	5	10	204	36.27	44.12	25.98
4	132	95	18	57	65	27	3	17	414	27.05	47.34	22.95
5	179	105	34	79	82	44	14	29	566	29.86	45.41	27.56
6	298	170	61	139	119	45	17	33	882	24.26	43.88	28.34
7	304	193	94	152	123	46	23	31	966	23.08	43.69	31.06
8	295	191	85	187	103	31	25	27	944	19.70	46.19	34.32
9	262	165	55	160	74	24	18	18	776	17.27	47.29	32.35
10	143	93	46	100	28	10	13	16	449	14.92	48.78	38.98
11	83	43	23	46	22	7	4	7	235	17.02	43.83	34.04
12	30	22	14	15	9	1	6	3	100	19.00	41.00	38.00
13	7	2	9	4	1	0	0	1	24	8.33	29.17	58.33

Table 7.5 Projectile Points from DN27. Block 1

	LEVEL									
	3	4	5	6	7	8	9	10	11	13
ARROW PT										
Washita	1/-			-/2	-/2	3/-	1/-	1/1		
Talco		-/1								
Bonham-Alba		-/1			3/-	2/-	1/2		-/4	
Catahoula		-/1	-/1	1/2						
Fresno		-/1		-/1			-/1	-/2		
Scallorn			1/1	1/1	-/1		-/1			
Indet.	-/1	1/-			-/2	-/1			1/-	1/1
TOTAL	2	5	3	8	7	6	6	4	5	2
% Chert	50	20	33	25	57	83	33	25	20	50
DART PT										
Gary	-/1	-/4		-/2	-/4	-/4	-/2			
Godley	-/1	-/1	1/-	1/-	-/1	-/3	-/2			
Ellis			-/1							
Ensor					1/-			-/2		
Dallas				1/-			-/1			
Trinity										1/-
Indet.	1/3	1/8	1/3	2/10	6/10	5/8	2/12	1/8	1/5	2/2
TOTAL	6	14	6	15	22	20	19	11	6	5
% Chert	17	7	17	20	32	25	11	9	17	60

/ = chert/quartzite

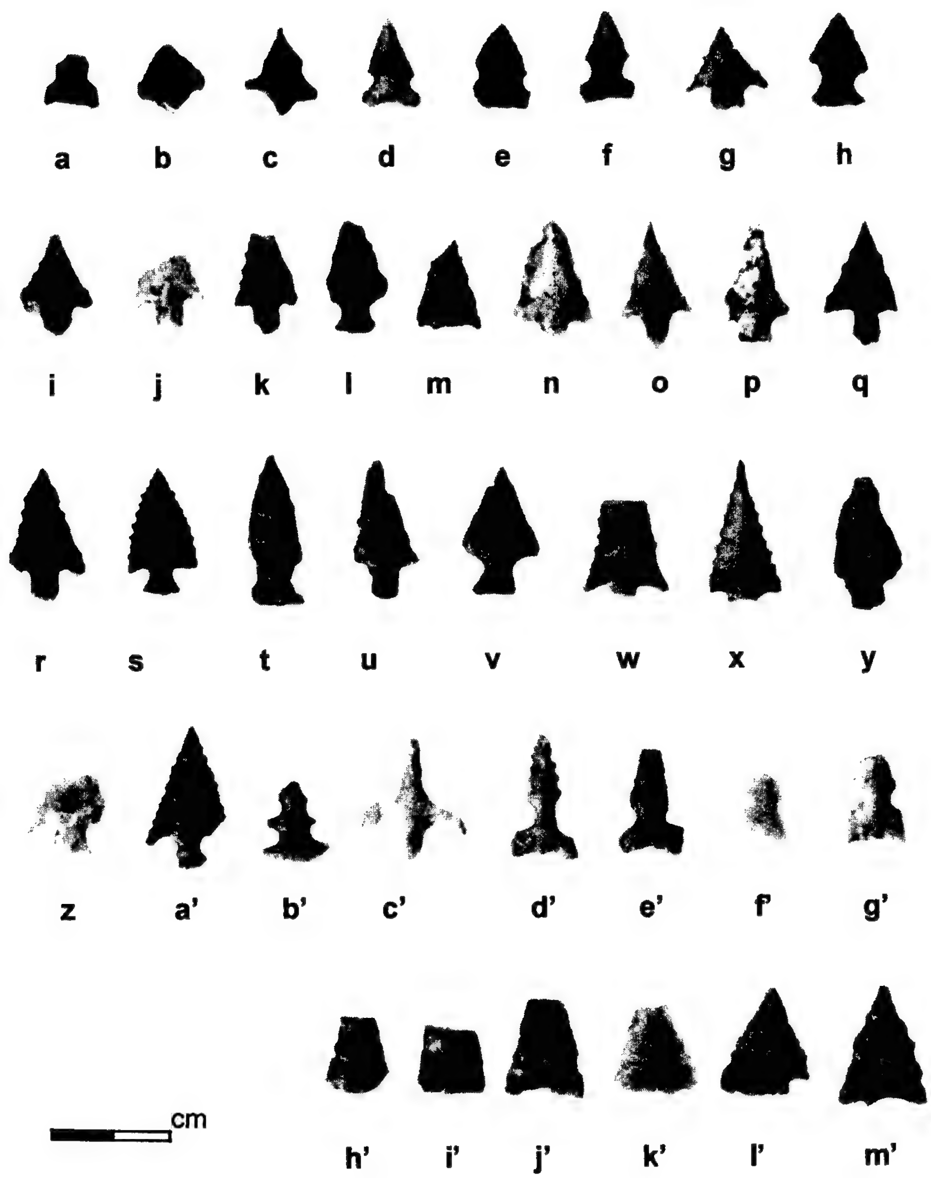


Figure 7.9 Arrow points from 41DN27. a (9), b (2), c (5), d (8), e (8), f (6), g (11), h (6), i (TP3), j (7), k (4), l (7), m (12), n (9), o (11), p (6), q (11), r (11), s (8), t (7), u (9), v (7), w (7), x(13). y (8), z (5), a' (11), b' (4). c' (6), d' (2), e' (6), f' (7), g' (9), h' (12), i' (4), j' (6), k' (10), l' (9), m' (10) [(x) = level].

The radiocarbon ages and ceramics argue for quite late occupations, well within the Late Prehistoric II period. This contrasts sharply with the Gary-Godley association, derived from Late Archaic occupations. Chert use for both dart and arrow points is quite low (Table 7.5), even in this region where quartzites are always quite common among tools.

The ceramic assemblage for B 1 consists of a total of 449 sherds of which 81% are tempered with crushed mussel shell. Other types of tempering include grog (11%), no temper (2%), bone (2%), sand, sand/shell, shell/bone, sand/bone, sand/shell/bone, and sand/grog. The latter tempering materials occur in less than 1% of the assemblage. Sherds with possible bone temper occur in levels 6-11, with the distribution being in the lower, or downslope, portion of B 1. This being the case, they occur very near the ground surface. This stratigraphic association is mentioned because bone-tempered ceramics are believed by some researchers to be indicative of Late Prehistoric I occupations (Prikryl 1987:173). One body and one rim sherd each have a uni-directionally drilled hole which functioned most likely to repair a crack. All sherds have plain, smoothed and/or polished exteriors and interiors and are classified as Nocona Plain ware.

The ceramic assemblage includes a total of 20 rim and 4 basal fragments. The basal fragments consist of portions of the vessel sides and the basal inflection point. The configuration of the basal inflection points indicate the vessels had flat bottoms. One base, from level 12 at E 9 S 69, has a diameter of approximately 10 cm. A second base, from level 7 at E11 S70, has a diameter of approximately 6 cm. There are two kinds of rim sherds. The first rim type is straight with a rounded lip which represents a bowl or conical-shaped vessel. The largest, and only sherd large enough to measure, has an orifice diameter of approximately 36 cm. Immediately below the lip is a drilled hole. This sherd, from level 10 at E10 S67, is either non-tempered or is grog tempered.

The second rim type consists of an excurvate rim that is approximately 2.7 cm high and has a rounded lip which represents a globular shaped vessel. This rim, from level 11 at E8 S72, has an orifice diameter of approximately 30 cm. This rim is profusely tempered with crushed mussel shell that has been leached from the paste. All of the other rim sherds are too small to determine orifice diameters or vessel shape. Most have rounded lips, but one, recovered from level 5 at E13 S71, has a flat lip unlike the others. Based on types of temper, rim form, and base form, there are likely a minimum of three vessels represented in the assemblage from B 1. At least two styles of vessels, either a bowl or conical shaped pot and globular shaped pots were produced by the Late Prehistoric II occupants of the site.

A total of 495.5 kg of FCR was recovered, mostly from levels 4, 7, and 9-10. The concentrations of FCR correlate with the occurrence of rock hearths, refuse areas, and the bison bone pit (Feature 2).

The spatial distribution of artifacts is influenced by the slope of the terrain, with level 7 representing material in the central portion of B 1 while level 11 represents material downslope from that depicted in level 7. In both cases, artifacts tend to be associated with the features. The types of artifacts indicate cutting, scraping, and cooking tasks were performed. There does not appear to be any patterning of specific types of tools or artifact types indicative of special purpose activity areas. Rather, a variety of tasks were performed within the same work areas.

Vertebrate Faunal Remains

The two blocks (and Test Unit 11) excavated at 41DN27 during the mitigation phase generated a total of 27,197 vertebrate faunal remains (Table 7.6; see also Appendix B, Tables B27.1-3).

Table 7.6 Faunal Totals from 41DN27

Block	Total Bone	%ID	%Burned
1	25,229	12.5	34.2
TU 11	643	16.2	30.9
3	1,325	7.4	12.6

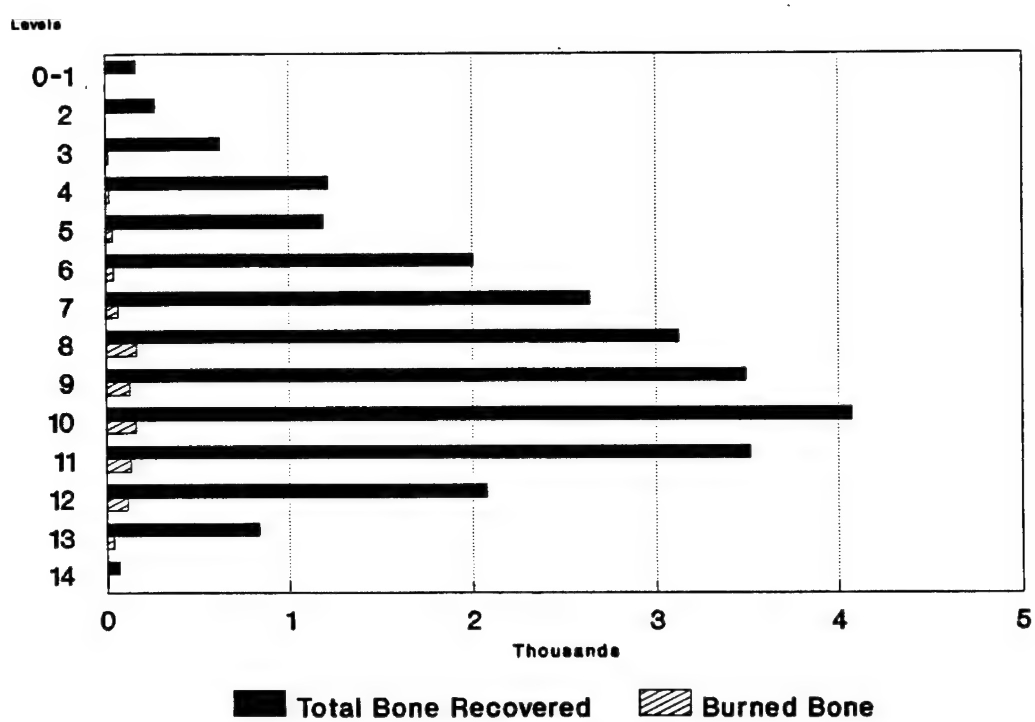


Figure 7.10 Faunal summary, 41DN27.

Over half of the faunal remains from Block 1 were recovered from levels 8 through 11 (Figure 7.10). This suggests a correlation between preservation and depth of burial. The deeper faunas here also exhibit a much higher frequency of burning, which appears to enhance preservation. Only 126 identified elements were recorded outside Block 1; therefore, the 3,165 identified elements from Block 1 have been chosen as representative of the components for this site (Table 7.7).

Certainly the most interesting aspect of this site regarding faunal remains are the features (Table B27.2). Feature 4 is notable for the diversity of taxa, primarily non-mammalian remains. Features 2 and 12 are distinctive because they are dominated by bison remains.

Feature 2 is especially significant for the deliberate character of its construction and filling. It is a pit 45 cm deep and about 100 cm in diameter. The flattened bottom is paved with nine bison scapulae, representing six individuals. Around the perimeter of the pit floor, excavators found several burned cobbles and small boulders. The pit was filled with cracked-open long bones of bison and a few (15) elements of other species

Table 7. 7 Faunal Remains from 41DN27, Block 1

	LEVEL												
	1	2	3	4	5	6	7	8	9	10	11	12-14	Total
CATFISH									7	4	6	4	21
DRUM								1					1
BASS/SUNFISH									2	2	2	3	9
INDET. FISH			1		1	1	1	8	18	35	24	34	123
TOAD/FROG							1					3	4
MUSK TURTLE										2	1		3
MUSK/MUD TURTLE				1	2	2	1	1			1	1	9
POND/MAP TURTLE								1					1
DIAMONDBK TERRAPIN									1				1
SLIDER TURTLE									1		1	3	5
BOX TURTLE					1	6	6	7	28	17	5	4	74
SOFTSHELL TURT.										1	1		2
INDET. TURTLE	1	1	11	18	38	28	43	119	68	112	82	80	601
NON-VEN. SNAKE							1	1		1	1		4
VIPER								1					1
INDET. SNAKE					1			17	19	1		3	41
LIZARD										1			1
DUCK/GOOSE									1	1	1		3
TURKEY										1			1
PRAIRIE CHICKEN									6			1	7
BIRD SMALL								1			1	1	3
BIRD MEDIUM									7	7	1	1	16
COTTONTAIL				2		6	3	9	27	37	22	17	123
JACK RABBIT											1	1	2
SWAMP/JACK RABT						1	1						2
TREE SQUIRREL											1	1	2
BEAVER					2			2	1	1			6
POCKET GOPHER				6	4	4	4	4	9	19	10	21	81
POCKET MOUSE							2						2
COTTON RAT								2	1	1	1	12	17
VOLE									1			2	3
INDET. RODENT				1	1			5	2	3	2	16	30
RACCOON							1						1
SKUNK									38				38
MINK										2	1		3
DOG/COYOTE												1	1
CARNIVORE												1	1
WHITE-TAILED DEER	1	3	23	24	45	63	83	94	101	105	65	36	643
BISON	1	18	30	39	51	69	94	118	73	38	38	34	603
MAMMAL SMALL					1	3	8	11	4	30	26	28	111
MAMMAL MEDIUM		1		13	6	2	9	7	20	18	37	40	153
MAMMAL LARGE		6	20	19	33	21	45	61	54	48	38	67	412
Total	3	29	85	123	186	206	303	470	489	487	369	415	3165

(Table B27.2) mixed in the fill. Of the bison elements, noticeably scarce are teeth and podials; only one large piece of tooth enamel and a carpal fragment were recorded representing animals as large as a bison.

Seven individual bison of various ages are represented by the long bones in Feature 2, including out of a total of nine humeri, five individuals, and out of 19 femur fragments, seven individuals. In addition, there were 11 tibia fragments, eight whole vertebrae, and numerous axial fragments. The long bones (femur, humerus, tibia, and radius) exhibit clean, spiral breaks in the mid-shaft area, with the ends intact and undamaged, except for gnawing. Actually, 65% of the identified bones were gnawed, suggesting that dogs or scavengers of some kind had access to the broken bones before they were cached.

The cache was then topped by the crania of two juvenile bison (Figure 7.6a). Feature 2, however, contained few bones that could be determined to represent bison of this age group (yearling or younger). Their remains either were consumed or not recovered. Additionally, it was observed from the condition of the bones that some of the elements had been subjected to different taphonomic factors; some were more bleached out before interment, and others may have been semi-articulated (e.g., rib and vertebral fragments). Most however appear to have been tossed in at random after marrow removal. It is conjectured that the purpose of the cache was to bury the bones for possible retrieval and bone grease rendering at a future time. Frison (1978) reports the use of antelope skulls to mark a cache pit in the northern plains.

Feature 12 is a hearth-like feature that yielded a single potsherd and numerous bones from a variety of animals. Only two of the bison bones from Feature 12 were burned. In contrast, 28% of the bones in Feature 2 were noted as charred (only two were calcined). The charring of the bison bones in Feature 2 resulted from the method used to remove the periosteum membrane that covers the shaft of the bone thereby allowing a cleaner, chip-free, break to extract the marrow. Bone-marrow extraction was not indicated by the remains in Feature 12.

The element distribution in the two features is also dissimilar. While Feature 2 was full of half long bones of bison, Feature 12 contained primarily broken teeth fragments, toe bones, some tarsals, and rib splinters, along with only five long bone fragments. The treatment of the bones differed as well. Forty-four percent of the elements in Feature 2 exhibited cut marks, but only 5% of the bison bones in Feature 12 were cut.

Of the faunal assemblage from Block 1 as a whole, deer are almost as numerous (Table 7.7). A minimum of four deer was recovered from Block 1, although no more than two individuals were recognized per level. Figure 7.11 compares the elements recovered from each level and with the apportionment of a representative carcass based on the number of codes for each carcass part. Teeth are over-represented, while vertebrae and toes are under-represented. These are non-meaty elements and suggest that the marrow-rich limb bones were processed for bone grease, leaving the undesirable remnants for disposal.

Few of the deer bones exhibit modification either in terms of burning (only 13.4% are burned) or cut markings (3.7%). Gnaw marks were found on 12% of the deer bones, which is in keeping with the faunal assemblage overall.

Sixteen bone tools were recovered. Two are deer ulna awls, one is a worked dog ulna shaft, and one is a bison scapula fragment with a beveled edge. The remainder are fragmentary awls or pins or indeterminate worked fragments.

In summary, the faunal assemblage from 41DN27 is notable for its cache pit of bison leg bones (Feature 2) and for its diversity of creatures (42 taxonomic categories). With the grassland bison, the site occupants exploited the full range of habitats that were available to them. Three families of fishes are represented, as well as amphibians, aquatic turtles, and waterfowl. At least five different turtle genera were taken. And the furbearers of the riparian forest were exploited: beaver, mink, raccoon, skunk, cottontail, squirrel, and dog or coyote. Rodents and small reptiles may be accidental or incidental to the archaeological context,

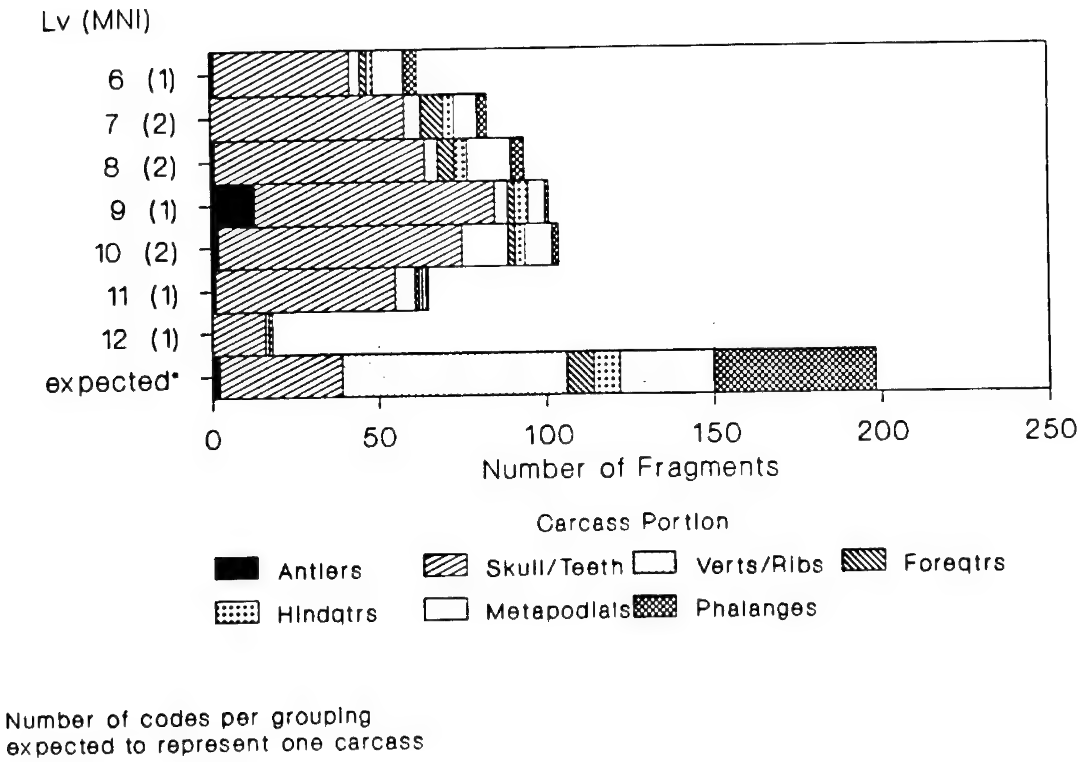


Figure 7.11 Deer element apportionment, 41DN27, Block 1.

but they add to the picture of a complete, and probably healthy, ecosystem available to the hunters and gatherers of the Late Prehistoric period who camped in this location.

A small quantity (1.14 kg) of mussel shell was recovered from B 1 (Table 7.8). Most of the shell is highly fragmented with the exception of shell from Feature 10 which totaled 62 hinges. A total of 198 hinges, of which 103 are right and 95 are left, were recovered from the entire block. Most of the shell was from Feature 10 in levels 7-10.

Overall, densities of faunal materials and shell increase with depth in the site (Table 7.8). FCR and artifact densities are irregular, because of the different positions of rock-lined hearths in the section and because of different occupation episodes. Both burial depth per se, and proximity to calcareous bedrock probably account for the faunal preservation pattern, although the higher proportion of burned bone may be significant as well.

Block 3

The artifact assemblage from B 3 represents activities associated with hunting, cooking, and tool maintenance. A total of 6 dart points were recovered from levels 18-22 (Table A27.2), including Gary, Wells, Yarbrough, and Morrill/Kent-like types. No arrowpoints were recovered. The Gary and Yarbrough types are believed, by some researchers (Prikryl 1987:125), to represent Late Archaic occupations while Wells and Morrill types represent Middle Archaic occupations. Within B 3 there is no stratigraphic evidence to confirm those proposals.

Table 7.8 Density Data, 41DN27, Block 1

level	debden (n/m3)	toolden (n/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	% burned bone
1	85.0	0.0	0.0	135	550.0	19
2	42.9	8.6	1.4	110	382.9	17
3	113.3	5.6	16.1	439	347.2	18
4	172.5	7.5	6.7	15780	505.8	21
5	157.2	5.3	9.7	1553	330.3	29
6	183.8	5.4	14.0	1325	418.1	28
7	172.5	6.6	20.2	19645	471.8	24
8	168.6	8.6	23.4	1771	557.9	33
9	146.4	5.8	47.0	17354	658.3	37
10	132.1	8.5	42.1	64531	1197.1	44
11	94.0	8.0	41.2	1128	1405.6	39
12	76.9	2.3	117.7	7488	1596.9	46
13	120.0	50.0	485.0	2950	4180.0	49
Mean	141.7	6.4	19.6	8267	469.9	32
Std Dev	34.7	1.8	31.1	18571	444.7	9

Raw materials used in the manufacture of the dart/spear points in B 3 include locally available quartzite (83%) and an indeterminate type (17%). Consequently, there is little evidence for the use of non-local lithic sources for the manufacture of dart/spear points recovered from B 3.

The ceramic assemblage consists of 8 body sherds of which 7 are tempered with crushed mussel shell and one has bone temper. All of the sherds were recovered from the uppermost levels, 17-19. The sherds have plain, smoothed exteriors and interiors and are assigned to Nocona Plain ware. They are indicative of a Late Prehistoric II occupation which appears to be confined to the uppermost levels, 16-19, within B 3. Based on the absence of ceramics and arrowpoints, and the presence of stemmed dart/spear points, the lower levels, 20-23 within B 3 are assigned to a Late Archaic occupation.

The debitage assemblage from B 3 consists of 850 (76%) quartzite and 272 (24%) chert flakes and chunks (Table A27.5). Examination of debitage raw material types indicates there is a slight decrease in the relative percentage of quartzite for the uppermost 3 levels (i.e., 16-18). This closely corresponds with the occurrence of ceramics and may be indicative of a slight shift in acquisition of lithic resources from the Late Archaic to the Late Prehistoric II periods.

The assemblage from B 3 consists of a total of 259 (24%) flakes with cortex and 815 (76%) interior flakes. There is a slight decrease in the relative percentage of flakes with cortex in levels 17-18, suggesting the Late Prehistoric II occupation, for this portion of the site, did not involve as much primary chipped stone tool manufacturing as did the previous Late Archaic occupation. Only one formal tool, a possible knife, was recovered from B 3. For the Late Prehistoric II component only 40% of the retouched pieces are made from local raw materials while for the Late Archaic component approximately 75% are made from local materials. This difference may be accounted with regards toward territorial sizes changing through time.

The faunal assemblage from B 3 consists 98 (7%) identified bone specimens and 1,227 (93%) unidentified fragments (Table 7.6). Of the unidentified bone, 1,060 (86%) are unburned and 167 (14%) exhibit evidence of burning. The low frequency of identified bone may be attributed to high efficiency in bone processing such as the extraction of marrow and bone grease. Stratigraphically, levels 16-18, which represent a probable Late Prehistoric II occupation, have far less identified bone relative to the lower levels which represent a probable Late Archaic occupation. The presence of ceramic technology during the Late Prehistoric II period would have made the extraction of bone grease more efficient which would have correspondingly increased bone fragmentation. The greater relative percentage of burned bone from the lowermost levels corresponds to the presence of the hearth (Feature 8) in levels 19-21. Only a small quantity of mussel shell (8.0 g) was recovered from B 3. A relatively large quantity of FCR, 67.4 kg (Table A27.6), was recovered from levels 20-21 which corresponds with Feature 8, the rock-lined hearth.

Summary

Site 41DN27 contains well preserved Late Prehistoric II occupation remains and a less well preserved set of materials from apparent Late Archaic occupations. Two radiocarbon ages place the Late Prehistoric II occupation at approximately 525-668 BP, or toward the beginning of the Late Prehistoric II period. This temporal placement may explain the spatial association of a wide variety of both Late Prehistoric I and Late Prehistoric II projectile point styles. The occurrence of dart points is attributed to both bioturbation of the deposits and the possible continued use of Gary point forms into the Late Prehistoric period.

The Late Prehistoric II occupation, which is best represented in B 1, is characterized by a dominance of retouched pieces and a variety of arrow point forms. Relatively few formal tools were recovered. A predominance of hunting and tool manufacturing activities is suggested. At least two styles of ceramic vessels are represented. One style consists of a large bowl or conical shaped pot and the other is a medium-sized globular pot. This is based on large rim sherds and basal fragments. Some of these vessels had flat bottoms. All of the pottery is assigned to Nocona Plain ware, a Late Prehistoric II type of pottery common in the region.

Cooking activities are evident by the presence of several rock-lined hearths and large burned areas. Refuse areas are situated downslope from the hearths. The occurrence of a prepared pit, which was partially dug into the underlying Woodbine sandstone, containing large quantities of bison skeletal remains indicates bison as well as deer were a primary food source during the Late Prehistoric II occupation of this locus of the site.

The faunal remains suggests efficiency in the exploitation of both prairie and woodland/riparian habitats. Extraction of marrow and grease from skeletal elements is suggested by the bone filled pit. This is especially true for the Late Prehistoric II occupation as evidenced in B 1 and in the upper levels of B 3. The presence of several metates, one of which had been turned upside down, and other ground stone implements indicates the preparation of plant and animal foods. The large quantities of cores and blank-preforms, in addition to a large small flake to large flake ratio, also indicates the manufacture and maintenance of stone tools were primary tasks performed at the site during both the Late Archaic and Late Prehistoric II occupations.

All of the evidence indicates the site was used as a base camp for hunting and gathering activities during both the Late Archaic and Late Prehistoric II occupations. The absence of recognizable architectural remains suggests temporary, seasonal use, although their preservation and possible detection would be difficult in these sandy sediments. The occurrence of the site on a slope consisting of sandy deposits has resulted in the possible mixing of Late Archaic and Late Prehistoric II materials within B 1. to a buried high-pressure gas line which was thought to have possibly disturbed this portion of the site.

The mixing of Late Archaic and Late Prehistoric II remains at this site is believed to have been similar to that at site 41DN26, located less than 1 km to the west. The degree of slope is similar between the two sites, and the sedimentary matrix at both sites is loamy sand. It is believed that after the site was abandoned by Late Archaic populations, the hill slope underwent erosion which removed most of the unconsolidated deposits. Consequently, the larger artifacts were left as a lag above and on the underlying Woodbine Sandstone bedrock.

Following this erosional episode, colluvial deposition renewed, accommodating the Late Prehistoric group(s) with a surface for occupation and also sediments within which to excavate pits. Continued colluvial deposition buried the Late Prehistoric occupation debris, while post-depositional turbation continued to adversely affect physical and chemical preservation.

CHAPTER 8: 41DN372

Description

Site 41DN372 is located at an elevation of ca. 525-530 feet MSL on the west bank of Little Elm Creek (Figures 1.2, 8.1). It is located at the eastern edge of a broad, flat Pleistocene terrace which is underlain by deeply weathered, fine loamy alluvium. The site is adjacent to the steep terrace scarp that has been cut by the channel of Little Elm Creek near its confluence with Pecan Creek. The main site area centers on a low knoll which is, in part at least, a culturally constructed feature or midden mound. This is most evident in the southern part of the knoll in the vicinity of BHT 6 and Block 1 (Figure 8.1) Historic period occupation of the site area was indicated by large quantities of historic remains in the northern part of the knoll. Unlike the other sites mitigated at Lake Lewisville, therefore, site 41DN372 formed on a stable surface. It is too high to have been subjected to flooding by Little Elm Creek, and there are no topographic features that would promote either colluvial deposition or intensive erosion. Today the site is being gradually eroded by gullies that are extending headwards from the creek valley towards the knoll. Overall, however, the geologic features of the site are the combined results of natural weathering and disturbance coupled with anthrogenic effects including midden construction.

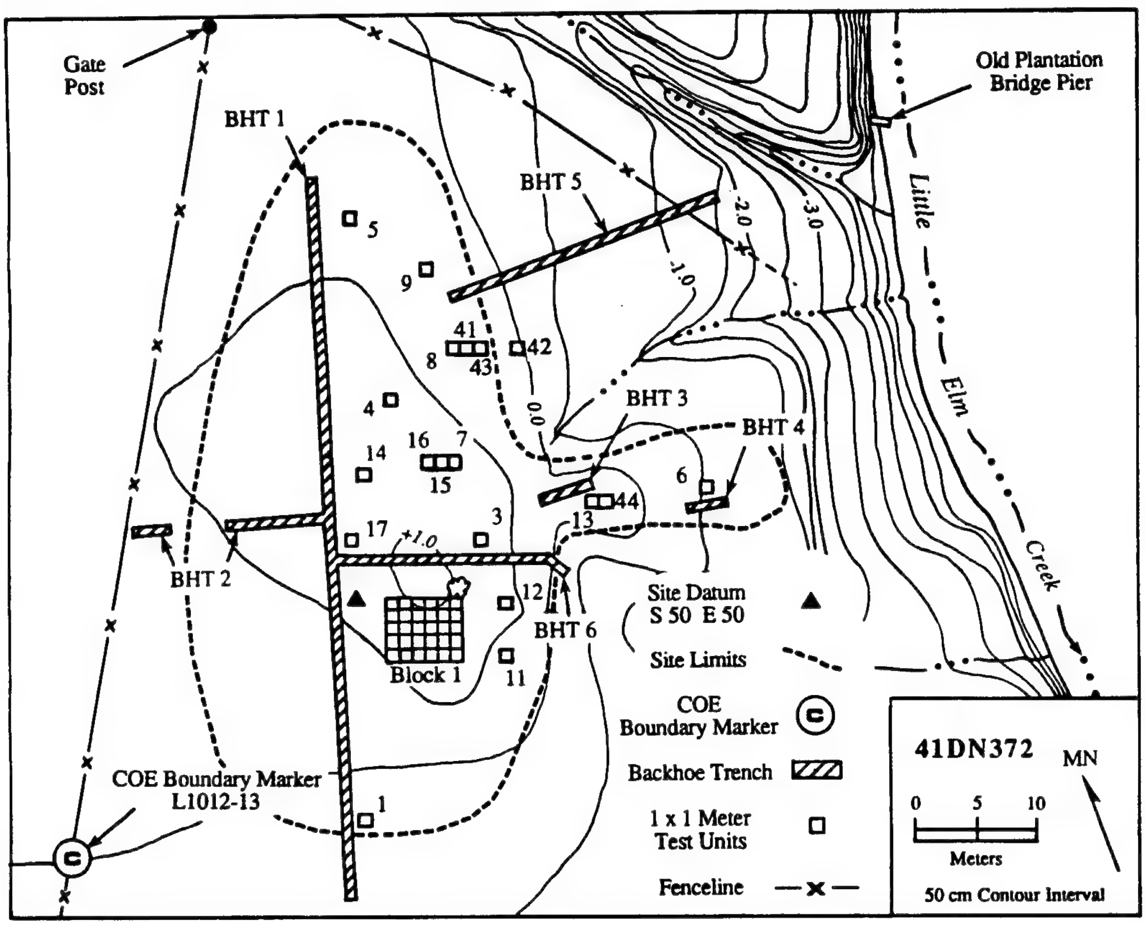


Figure 8.1 Map of site 41DN372. Site formed on Pleistocene terrace of Little Elm Creek, the bench at the 0.0 elevation. Block 1 excavations are situated on the southern half of the Late Archaic- Late Prehistoric midden.

Previous Research

Testing consisted of five BHT's and manual excavation of 17 1x1 m TP's (Figure 8.1). TP's were dug to depths ranging from 20-130 cm below ground surface. The BHT's revealed several burned rock features surface in some portions of the site. Organic remains are well-preserved and large quantities of bone, lithics, and some ceramics occur throughout the midden. Several of the features were partially excavated. These included four burned rock hearths and/or hearth cleaning debris and remains of a historic dugout or excavation into the midden (Brown and Lebo 1990).

Projectile points recovered during testing included Gary, Travis, Trinity, Bonham-Alba, Toyah, Scallorn, and Perdiz. Occurrence of well-preserved faunal remains and features warranted the site to be considered significant in yielding new information about the Late Archaic and Late Prehistoric periods (Brown and Lebo 1992).

Excavation

Excavation in 1988 by UNT included two BHT's, four 1x1 m TP's, and a 5x6 m block (B 1). The BHT's were placed northeast and southeast of the knoll in order to expose the deposits between the knoll and the Little Elm Creek channel. BHT 6 clearly exposed the stratigraphy of the midden mound (Figure 8.2). The

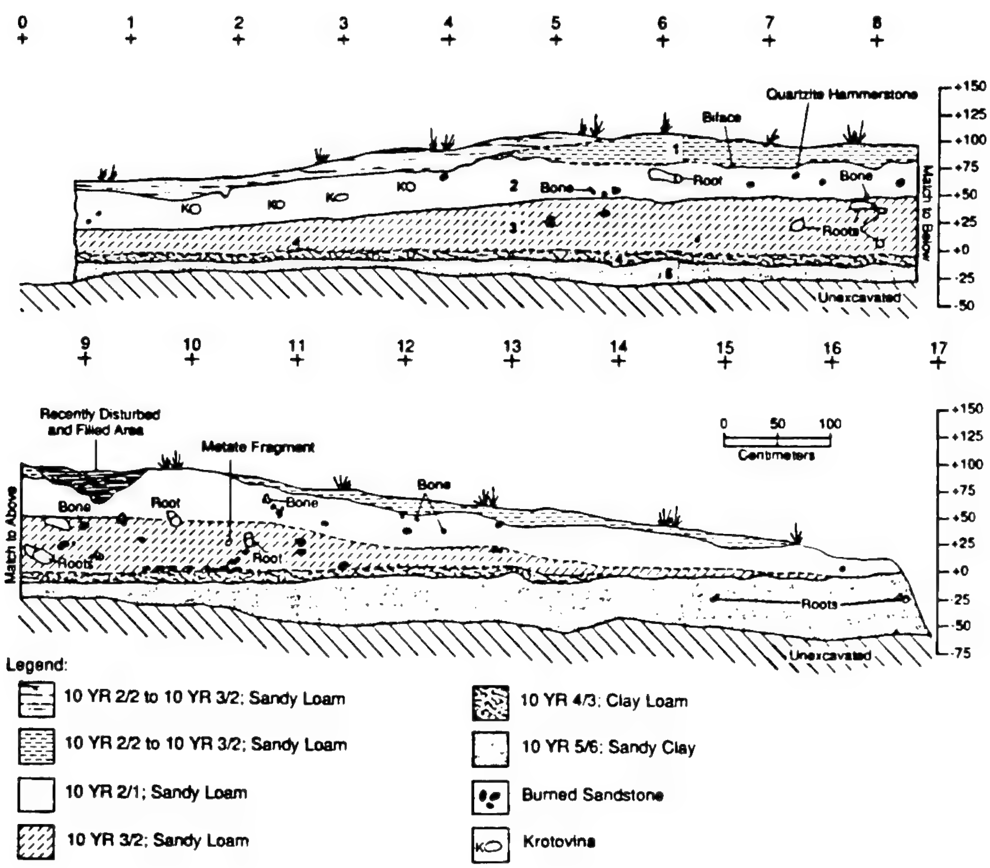


Figure 8.2 Profile of the north wall of BHT 6 at 41DN372.

mound fill consists of black to very dark gray sandy loam to loam sediments, with abundant charcoal, burned rocks and artifacts. These sediments overlie the B horizon of the soil that formed in the terrace alluvium.

Two of the TP's (TP's 41 and 43) were placed adjacent to and east of TP 8 (Figure 8.1) forming a 1x3 m trench while TP 42 was placed downslope from them in order to better understand the nature of the FCR concentration in this portion of the site. TP 44 was placed adjacent to TP 13 in order to better expose the FCR in this area of the site.

B 1 was excavated between TP's 2 and 10 based on results of testing in this portion of the site (Figures 8.1, 8.3). TP's 2 and 10 were incorporated into the 5x6 m block. Seven 1x1 m units were selected for fine screening in order to recover smaller material (Figure 8.3). The stratigraphy of the midden mound in the area

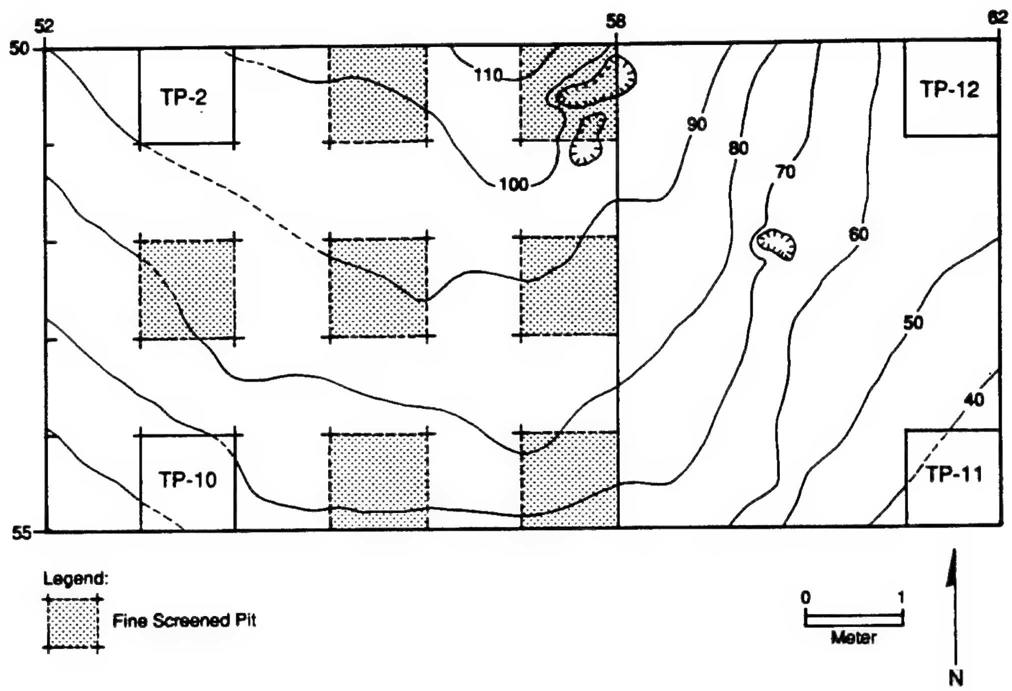


Figure 8.3 Surface contours of Block 1 at 41DN372.

of Block 1 is consistent with that exposed in BHT 6 (Figure 8.4). This block could not be located in a more central position on the mound because of a huge pecan tree growing there.

Block 1 Features

Seven hearth features were recorded in B 1. The hearths are characterized by concentrations of FCR, bone, and charcoal. Table 8.1 shows the size, provenience and probable cultural affiliation for each feature.

Feature 2, first discovered during testing (Brown and Lebo 1990), was fully exposed and determined to be a well-preserved rock-lined hearth. It occurred within excavation levels 6-7 (15 cm thick) and measured approximately 50x65 cm (Figure 8.5).

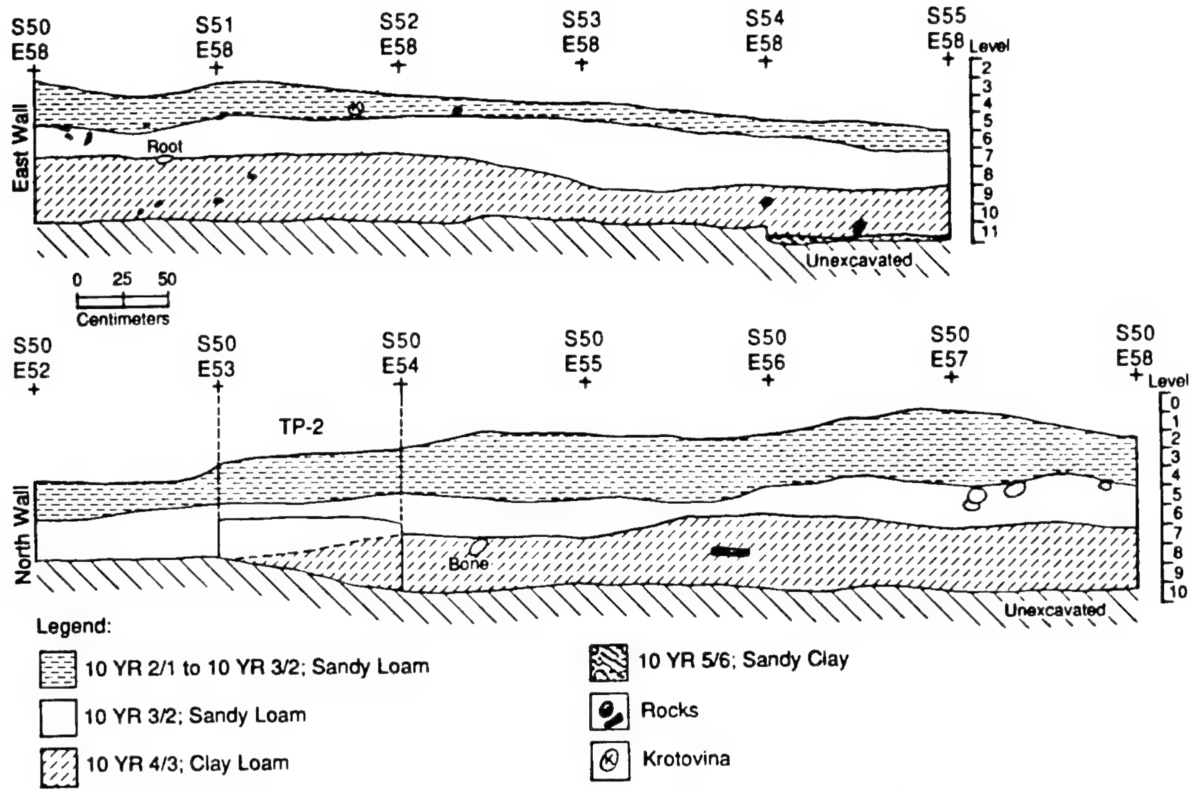


Figure 8.4 Profiles of the east and north walls of Block 1 at 41DN372.

Table 8.1 Provenience and Attributes of Features at 41DN372, Block 1

Feature	Type	Levels	Elevation (datum)	Depth (cm bs)	Size (cm)	Age*
1	hearth cleaning			78-83	80x100	1
2	rock-lined hearth	6-7	61-47	21-36	50x65	3
3	fence post			40-123	?	4
4	hearth cleaning			25-50	?	3?
5	rock-lined hearth	5-7	68-49	28-47	25x60	3
6	rock-lined hearth	6-7	60-47	31-44	92x98	3
7	rock-lined hearth	6-7	62-41	23-44	48x56	3
8	rock-lined hearth	7	48-40	37-45	80x80	3
9	rock-lined hearth	8	50-42	30-38	78x80	3
10	pit	11	60-72	60-72	33x14+	1
11	basin hearth	7-8	43-34	15-24	40x60	3

* 1 = Late Archaic 2= Late Pre. I / II
3 = Late Pre. II 4 = Historic

Feature 5 was a disturbed basin-shaped hearth that occurred within levels 5-7 (18 cm thick) and measured approximately 60x25 cm. The hearth fill contained burned bone, charcoal, flakes and FCR. It is associated with Features 7 and 8 in the same level. Feature 6 was a rock-lined basin-shaped hearth that occurred within levels 6-7 (10 cm thick) and measured 98x92 cm (Figure 8.6). FCR was concentrated in the upper part of the basin fill.

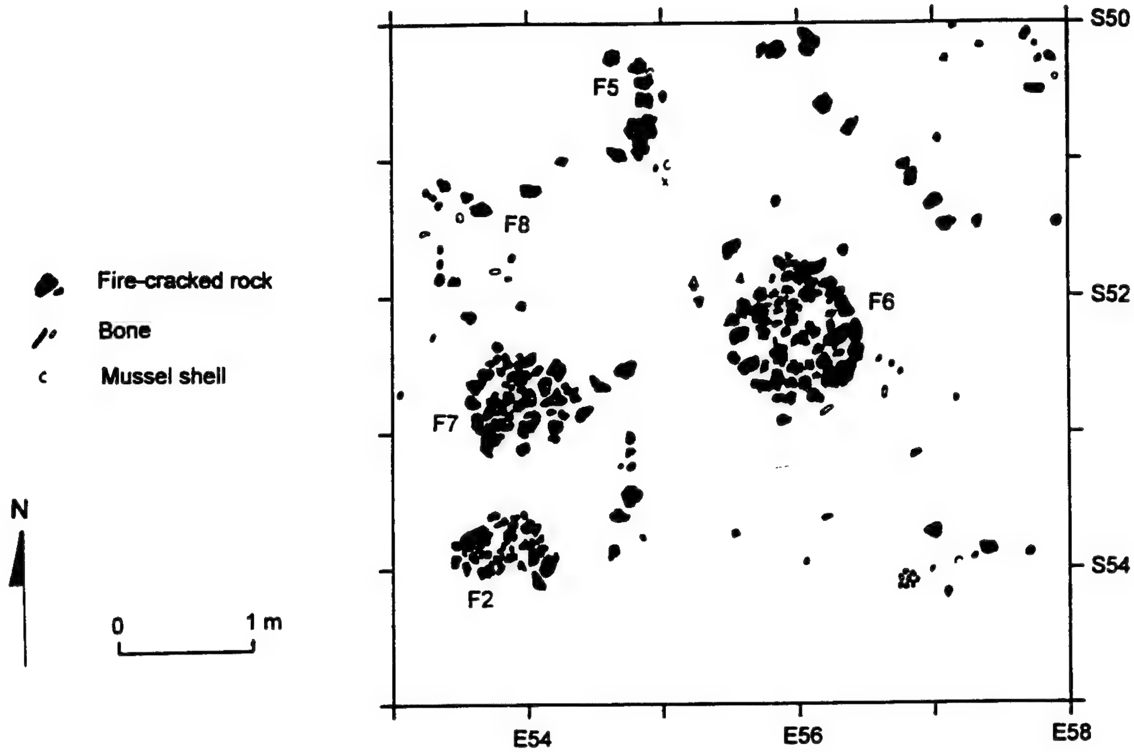


Figure 8.5 Plan of Level 6 features at 41DN372, Block 1.

Feature 7 was also a rock-lined hearth that occurred within levels 6-7 (21 cm thick) and measured 48x56 cm; it contained burned and unburned bone, burned sandstone and two flakes. Feature 8 was a disturbed, rock-lined basin hearth that contained burned earth, burned and unburned bone and FCR. It occurred within level 7 (8 cm thick) and measured approximately 80x80 cm. The base of a historic wooden fence post was in the east wall of the unit that contains Feature 8.

Feature 9 was a rock-lined hearth that contained the remains of 2-3 partially intact turtle carapaces, charcoal and a projectile point. It occurred within level 8 (8 cm thick) and measured 80x78 cm. Feature 11 was a well-preserved hearth that occurred within levels 7-8 (9 cm thick). This feature was not totally exposed since it extended into the south wall of B 1. The area exposed measured approximately 40x60 cm; the hearth contained only one large burned sandstone fragment as well as charcoal, bone and shell.

Feature 1, originally found during testing in TP 8, was further exposed in TP's 41 and 43. It consisted of a dense concentration of FCR with very little bone or charcoal associated with it. A human tooth was recovered from level 9 within TP 41. This feature is believed to represent hearth cleaning debris. The recovery of several Late Archaic dart/spear points and absence of arrow points and ceramics suggest a Late Archaic affiliation for this feature.

Figure 8.6 Feature 6 in Block 1 at 41DN372.

Feature 4, originally found during testing, was further exposed in TP 44. The feature was marked by a dense concentration of FCR with very little associated cultural debris. This feature is also believed to represent hearth cleaning debris.

Feature 10, a circular pit with a basin-shaped bottom, was delineated in TP 41. It consisted of a dark soil stain that occurred within level 11 (12 cm deep). Only part of the feature was excavated since a portion of it extended into TP 8 which was excavated during initial testing. The stain was apparently not observed during the excavation of TP 8. The portion of the feature exposed in TP 41 measured 33x14 cm.

Radiocarbon Age

A single radiocarbon age was obtained on charcoal recovered from level 7 of Unit E54 S52 within B 1. Following extended counting, the sample yielded an uncorrected age of 610±90 BP (Beta-32980). The corrected age intercepts are: 629, 583, and 562 BP (Stuiver and Becker 1987). This sample was collected in the vicinity of Feature 5, a disturbed hearth in levels 5-7. The pit presumably originated at least in level 5 if not higher. Thus the radiocarbon age pertains to materials higher in the site profile than level 7, the base of the pit.

Test Pits

Four 1x1 m TP's were dug in other portions of the site (Figure 8.1; Table A372.1). Two of these were contiguous, forming a 1x2 m unit (E59 S31 and E60 S31). The other two units were dug at E70 S43 and E64 S31. The sherds recovered from TP's are all tempered with crushed mussel shell and have plain, smoothed exteriors and interiors. The sherds are all classified as Nocona Plain.

A total of 13 dart points and 3 arrow points were recovered. The dart points include Gary, Godley/Trinity, Elam, Refugio, Yarbrough, Darl, and an asymmetrical stemmed type. Most of these point styles are associated with Late Archaic occupations. The three arrow points include only Bonham-Alba forms. The paucity of arrow points and ceramics from the TP's suggests that, with the exception of the uppermost levels, the areas away from the midden mound primarily contain remains of Late Archaic occupations. The stone tool sample from test pits is dominated by retouched pieces, with only one drill and a knife comprising the formal tool types.

Raw material types for the dart points include mostly locally available quartzite (54%) and petrified wood. Non local lithics include gray chert (31%) and orthoquartzite. The gray chert is probably from regional gravels, although an Edwards Plateau source could be possible. Raw materials for the arrow points include locally available Ogallala quartzite, possible Johns Valley chert from Oklahoma (Banks 1990), and a white opaque chert.

The faunal assemblage from the TP's consists of a total of 2,637 (19%) identified bone specimens and 10,965 (81%) unidentified fragments (Table B372.2). These bone frequencies tend to be as dense as those

in B 1. However, the frequency of identified bone from the TP's tends to be slightly less than that in B 1 (see below). Very little mussel shell was recovered (Table A372.3).

A dense concentration of FCR was encountered in the unit located at E59 S31. This is attributed to the presence of either a large rock feature or features in this portion of the site. This material is most likely attributed to a Late Archaic occupation.

Block 1

A total of over 29,000 lithic artifacts were recovered from the Block 1 excavations (Table 8.2). The high proportion of fine screen units in the excavation accounts for the recovery of huge numbers of small debitage, yet the density of lithic artifacts in the midden mound is high nonetheless. The non-debitage sample is clearly dominated by projectile points, which are ten times more common than cores and almost five times as abundant as blank-preforms.

Table 8.2 Assemblage Composition, 41DN372, Block 1

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	GRND ST	TOTAL
1	279	1	2	4	2		288
2	925		1	4	11	1	942
3	3686	3	6	8	19	3	3725
4	4121	1	7	12	27	1	4169
5	6386	3	5	7	39	1	6441
6	5986	3	7	9	35	3	6043
7	2741	2	6	2	15		2766
8	2500	2	1	5	14	1	2523
9	1749	2	2		7	3	1763
10	419						419
TOTAL	28792	17	37	51	169	13	29079
PCT	99.01	0.06	0.13	0.18	0.58	0.04	

Both cores and blanks are made mainly on Ogallala quartzite (Table 8.3). These are more common in the middle and lower levels of the block, associated with the Late Archaic/Transitional occupations. Biface fragments, on the other hand, include many more chert pieces. The relatively small proportions of cores and blanks suggest that on-site reduction of lithic materials was not a primary focus of lithic processing and use. The high frequency of quartzite among the cores and blanks contrasts with the high frequency of chert among the unifacial tools and arrow points. Thus, on-site core-blank reduction may have become less important through time. Alternatively, chert flake blanks and/or chert tools may have been introduced during the Late Prehistoric occupations.

Table 8.3 Tools and Cores, DN372, Block 1

CLASS/type	LEVEL 1	2	3	4	5	6	7	8	9
UNIFACIAL TOOLS									
Retouch	1/2	3/-	6/-	5/2	2/-	3/-		3/-	
End scraper	-/1				2/1		1/-		
Thumbnail scr				2/-		-/1	1/-		
Side scraper				1/-		-/1			
Drill		1/-	1/-	1/1		3/-			
Denticulate			-/1					2/-	
Graver					1/-				
Bifacial knife					-/1				
Bevelled knife						-/1			
Total	4	4	8	12	7	9	2	5	
% Chert	25	100	88	75	71	67	100	100	
BIFACE FRAG	2	5	10	12	8	14	7	5	7
% Chert	50	67	67	33	60	40	40	25	43
BLANK-PRE	2	1	6	7	5	7	6	1	2
% Chert	0	0	17	14	20	0	17	100	0
CORES									
Single plat			-/1		-/1				
Multiple plat			-/1		-/2		-/1	-/1	
Radial									
Core fragment	-/1		-/1	-/1		1/2	-/1	-/1	-/2
Total	1		3	1	3	3	2	2	2
% Chert	0		0	0	0	33	0	0	0
GROUND STONE									
Unprepared mano				1					
Prepared mano			1						
Unprepared metate						1			1
Mano-pitted stone						1			
Hammerstone		1	2		1			1	2

/ = chert/quartzite

The debitage from Block 1 shows consistently low chert frequencies for all levels (Table 8.4). The uppermost levels have somewhat higher proportions of large and cortical pieces, but there is no apparent change in chert use.

The retouched tool sample is dominated by chert raw materials, most of which are the tan to buff "regional cherts" that were probably procured to the west/southwest of the Elm Fork Valley (Ferring and Yates 1997). One scraper is made on a large flake of Alibates chert (Banks 1990). The tool types are dominated by

Table 8.4 Debitage, DN372, Block 1

	QUARTZITE				CHERT					INDICES		
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									TOTAL	%	%	%
1	12	1	13	9	1	1	1	1	39	10.26	30.77	61.54
2	49	17	41	28	9	4	3	5	156	13.46	34.62	49.36
3	215	47	92	59	28	6	12	12	471	12.31	26.33	37.15
4	308	74	164	122	48	15	24	22	777	14.03	29.99	42.73
5	391	103	218	145	49	5	19	33	963	11.01	29.70	43.09
6	373	88	217	170	58	8	20	31	965	12.12	30.78	45.39
7	297	72	206	113	52	5	25	11	781	11.91	25.74	45.45
8	153	22	108	64	18		11	5	381	8.92	23.88	49.34
9	121	6	69	38	15	1	12	6	268	12.69	19.03	46.64
10	20	3	20	10	7		3	2	65	18.46	23.08	53.85

simple retouched pieces. End scrapers, thumbnail scrapers and side scrapers occur in low numbers, although the thumbnail scrapers are indicative of Late Prehistoric affiliations. Notable is the presence of seven drills in the sample, which is also indicative of Late Prehistoric technology; these tools are not present in unmixed Late Archaic assemblages at Lake Ray Roberts (Ferring and Yates 1997). All of the drills from 41DN372 are of the "small" variety, with stems about 4-5 mm in diameter; these contrast with some of the "large" Plains Village drills of the Late Prehistoric period on the Southern Plains (Wedel 1961; Bell 1984).

The number of ground stone tools is quite small compared to the chipped stone sample (Table 8.3). This includes three manos and two metates in addition to hammerstones. All of the grinding implements are made of local sandstone, and all of the hammerstones are made of Ogallala quartzite cobbles.

The large sample of projectile points from Block 1 is dominated in the levels above 7 by arrow points (Table 8.5). Dart points are somewhat diverse in the lower levels, with Kent, Darl and Dallas forms associated with the most common Gary forms (Figure 8.7). This pattern of diversity gives way to low numbers of Gary and Godley forms in the upper levels. Except for the Kent and Gary pieces in levels 8 and 9, only one of the dart points is made of chert. This uniformity of raw material is very striking, even for a Late Archaic site in this region (Prikryl 1990; Ferring and Yates 1997).

The arrow point sample shows interesting changes through the mound stratigraphy. Triangular points (including Washita, Harrell and Maud) are found only in levels 2-5 (Figure 8.8). The lowest levels have Scallorn and Bonham-Alba. The "transitional" zone, in levels 6-4, exhibit the greatest diversity, with Catahoula, Fresno and Perdiz added to the types mentioned already. Scallorn, Catahoula and Gary points are associated at the Sister Grove site on the East Fork Trinity, and are dated to ca. 900-1,000 bp (Lynott 1981). Washita and Harrell forms are present in the southern Rolling Plains in Oklahoma by 950-1,000 bp (Hofman 1984). Natural and cultural agents of mixing were important during formation of this midden mound, making it a less than ideal place to develop a sound artifact chronostratigraphy. Nonetheless, it is quite striking that the patterns just described are even discernible.

Raw materials are different for several types of arrow points. All of the Washita and Harrell points are made of chert, whereas the other types are made of both chert and quartzite. The use of chert for those is Perdiz (50%), Bonham-Alba (44%) and Scallorn (53%). It is possible that both of the (quartzite) Fresno points are in fact preforms for Scallorn or Bonham-Alba types.

Table 8.5 Projectile Points from DN372, Block 1

	LEVEL								
ARROW PT	1	2	3	4	5	6	7	8	9
Washita		1/	2/	1/	1/				
Harrell				1/	1/				
Maud			-/2		-/1				
Perdiz			2/	-/2	2/	-/2			
Bonham-Alba			1/2	1/2	4/10	8/5	1/3	3/1	
Catahoula				-/1	1/3	2/			
Fresno					-/1	-/1			
Scallorn	1/	1/1	1/		1/1	2/1	-/1	-/1	1/1
Indet.		3/3	7/	9/6	7/1	6/3	1/4	3/1	
TOTAL	1	9	17	25	32	30	9	9	2
% Chert	100	56	76	56	31	60	22	67	50
DART PT									
Gary			-/2		-/1	-/3	-/2	2/2	
Godley		-/1		-/2		-/1			
Elam					-/1	-/1			
Darl								1/	1/
Dallas					-/1		-/1		
Kent									1/3
Indet.	-/1	-/1		1/1	-/1		-/2		
TOTAL	1	2	2	4	4	5	5	5	5
% Chert	0	0	0	25	0	0	0	60	40

/ = chert/quartzite

Of note is the presence of an indeterminate type arrow point that is made of black obsidian. The stone is probably from the Jemez Mountains in New Mexico (Jay Newman, personal communication). The piece has an expanding stem, and appears to have been deeply serrated (Figure 8.8 -g), but cannot be classified.

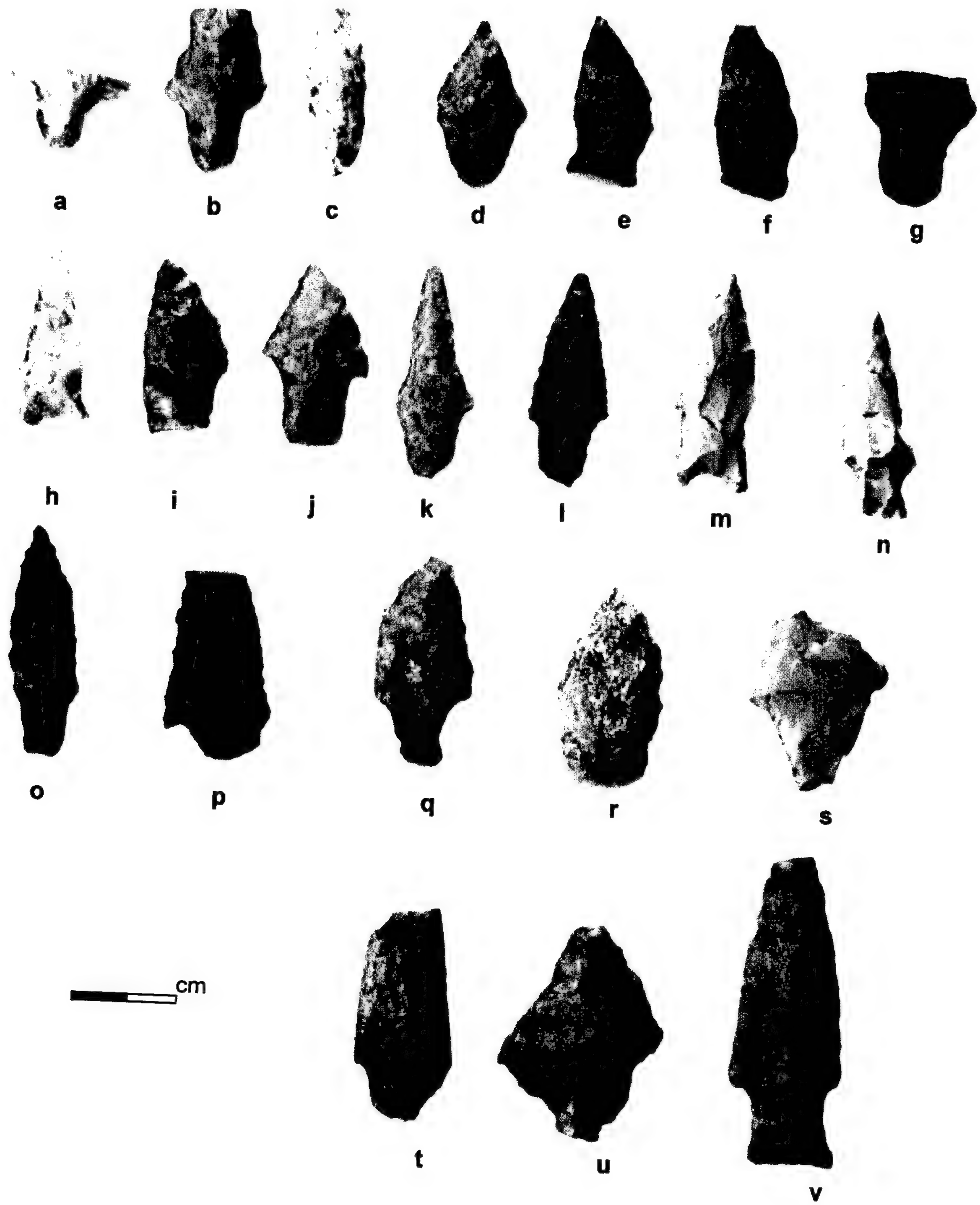


Figure 8.7 Dart points and preforms from 41DN372. Quartzite points: a(8), b(3), c(4), d(3), e(2), f(8), g (TP4), i(4), j(5), k(8), l(6), o (9), p (6), t(9), v(7); chert points: h(TP41/8), m (9), n(9), s(TP42/3); quartzite preforms: q(TP41/8), r (5), u (3) [(x) = block level or TP/level].

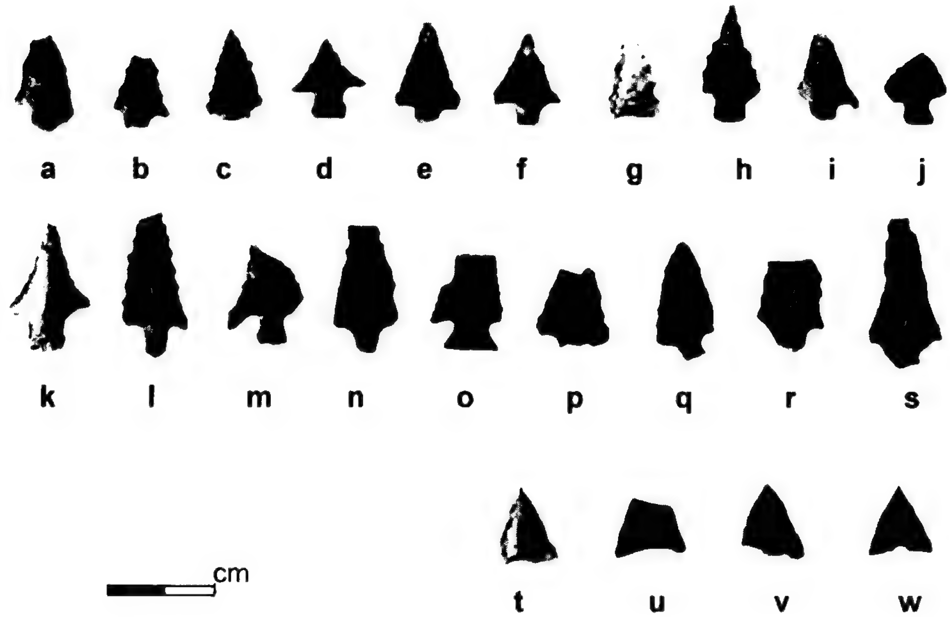


Figure 8.8a Arrow points from 41DN372. a (6), b (5), c (5), d (4), e (8), f (4), g (5), h (5), i (3), j (7), k (5), l (5), m (5) , n (6), o (6), p (6), q (7), r (2), s (6), t (6), u (3), v (5), w (5) [(x) = block level or TP/level].

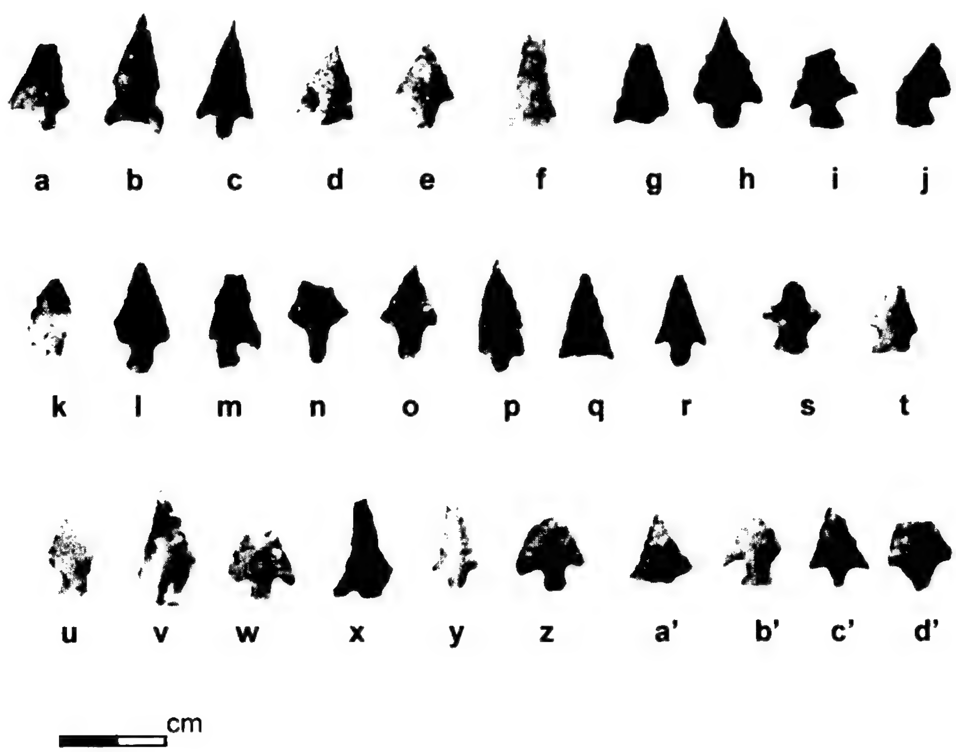


Figure 8.8b Arrow points from 41DN372. a (TP41/2), b (4), c (3), d (4), e (6), f (5), g (2), h (4), i (9), j (6), k (5), l (5), m (8) , n (4), o (8), p (5), q (6), r (6), s (6), t (7), u (4), v (6), w (1), x (5), y (6), z (5), a' (5), b' (3), c' (10), d' (5) [(x) = block level or TP/level].

The ceramic assemblage from B 1 consists of 543 sherds. This sample includes only 9 rim sherds and 3 basal fragments (Tables 8.6, 8.7). Tempering agents are varied, and include shell (61%), no temper (15%), sand/shell (7%), sand (6%), bone (5%), grog (3%), shell/bone (1%), sand/bone (1%), sand/shell/bone (1%), and grog/grit/bone, bone/grog, and shell/grit at less than 1% of the assemblage. The location of the site within the area of the Woodbine Sandstone Formation may account for the presence of sand in the paste of some ceramics. Therefore, the presence of sand may not be due to cultural factors, but rather the natural inclusion of sand in the clay used to make the pottery vessels.

Table 8.6 Diagnostic Sherds from 41DN372, Block 1

Description	Temper	Unit		Level
white slip	grog	Feature 7		8
white slip	none	55	51	2
slip	sand	55	52	3
slip	none	56	54	6
cordmarked	none	57	54	4
cordmarked	grog	58	54	4
decorated rim	shell	57	53	5
decorated	sand	58	51	5
decorated	grog	57	55	8
drilled hole in rim	sand	53	51	7
base	bone	56	54	5
base	shell	57	51	6
base	shell	54	52	6
coil break	none	56	53	5
coil break	shell	54	52	6
coil break	shell	56	55	6
coil break	shell	58	54	8

Table 8.7 Plain Sherds from Block 1, 41DN372

level	n	n/m3
1	7	17.5
2	32	32.0
3	71	47.3
4	100	58.8
5	141	64.0
6	149	62.1
7	34	10.0
8	8	3.5
9	1	0.6
10	0	
total	543	

Table 8.6 shows the provenience of diagnostic sherds which exhibit coil breaks, slips, and decoration. All other sherds within the assemblage have plain, smoothed exteriors and interiors. While the shell-tempered sherds are classified as Nocona Plain, the plain wares with other kinds of temper, as well as the decorated sherds are not assigned to established types. The presence of coil breaks indicates coiling with the use of a paddle-and-anvil was the method of pottery manufacture.

Rims consist of two forms. First, one form consists of a shell-tempered, excurvate rim that measures approximately 2.2 cm high and with a round lip. Its orifice measures approximately 20 cm in diameter. This rim form is from a globular shaped vessel and its largest rim fragment was recovered from E53 S51 in level 6. The large rim fragment exhibits evidence that the vessel was suspended by wrapping a cord around the rim. The evidence consists of a shallow polished "groove" around the edge of the rim which would have been caused by the rubbing of cordage used to suspend the vessel. A second rim of a similar type, with an orifice diameter of approximately 30 cm, has a height of 2.3 cm and was recovered from E57 S53 level 7.

The second rim type that occurs is an S-shaped rim with a narrow rounded lip. The rim has a height of approximately 1.1 cm from the lip to the first inflection point. This vessel has an orifice diameter of approximately 20 cm and was also globular shaped.

The decorated rimsherd (Table 8.6) exhibits two parallel incised lines, spaced 7 mm apart, that are perpendicular to the rounded lip. No other form of decoration is observable. This rim is too small to estimate orifice diameter.

All of the other rim sherds are too fragmentary to estimate orifice diameters and determine vessel shape. All have rounded lips and undecorated surfaces. A decorated small body sherd has a series of short, 6 mm long, incised hatch-like marks that occur end-to-end and parallel to each other.

Three recognizable basal fragments were recovered of which all are from vessels with flat bottoms. One fragment, tempered with possible bone, has a basal diameter of approximately 10 cm. It is different in thickness and temper from the other two basal fragments.

The two other basal fragments, tempered with crushed mussel shell, are believed to be from the same vessel. Both fragments have estimated basal diameters of 7 cm and consist of very friable, dark brown paste. The profile of the largest fragment indicates an excurvate vessel shape that most likely represents a bowl. Both sherds were recovered from level 6, but one was from E54 S52 and the other from E57 S51, a minimum distance of 2 m. This wide scattering of cultural debris makes it difficult to recognize specialized activity areas within the block excavation. Based on rim and basal forms, there are a minimum of two vessels represented by bases and four vessels represented by rims. By including temper type, then a minimum of 12 vessels is indicated.

In addition to the wares that are not shell tempered, two kinds of ceramics here are tentatively suggestive of an early Late Prehistoric component at the site. These include the cord-marked sherds, which may have affiliations with Plains Woodland cultures to the west-north of the project area in Oklahoma. Cord-marked pottery is well dated at Delaware Canyon to the first millennium AD (ca. 1,900-950 bp) (Ferring 1986b). Alternatively, these could have relations with the later Plains Villagers of the Llano Estacado. The Antelope Creek and Apishapa groups made cord-marked pottery after the Woodland period, from ca. 900-450 years ago (Lintz 1984).

The other ceramic type here that is of interest is the interior slipped, bone-tempered ware. This appears to be very similar to the Cooper Boneware as defined by Schambach (1982); this type is attributed to the Early Fourche Maline phase (ca. 2,300-1,800 bp) in southwestern Arkansas by Schambach.

This is the first time either cord-marked pottery or pottery similar to Cooper Boneware have been reported from this region. While correlations with Plains Woodland and Fourche Maline cannot at all be done at this time, this evidence suggests that an Archaic-early ceramic transition may well be registered at sites such as 41DN372.

A small quantity of mussel shell (0.35 kg) was recovered from B 1. Most of the shell was associated with hearths that occurred in levels 5-8. A total of only 58 hinges were recovered from the entire block.

A total of 932.6 kg of FCR was recovered from B 1. Almost all of the FCR was associated with rock hearths. Most of these features occurred in levels 1-2 and 5-8. The occurrence of Nocona Plain ware with these levels, in addition to associated radiocarbon date and arrow points, indicate the features can be attributed to Late Prehistoric occupation of the site.

The hearths appear to be the center of other activities besides food preparation. All of the other tool forms, including projectile points, chipped stone tools, pottery sherds, etc. tend to cluster in the immediate vicinity of the features. Because of the large number of hearths and artifacts recovered within the small block, 5x6 m for upper levels and 5x5 m for lower levels, is not conducive to delineating specialized work areas. Also, excavation of the block in arbitrary 10 cm levels has undoubtedly mixed some separate occupations.

Faunal Remains

Site 41DN372 produced more faunal remains than all of the other prehistoric sites investigated during the mitigation phase of this project at Lewisville Lake. A total of 78,577 faunal fragments were recovered from Block 1, and an additional 13,602 were recovered from Test Units (See Brown and Lebo 1992). The overwhelming majority of these remains come from fine-screened units within the excavation block. If each unit had been fine screened, this number would undoubtedly double. For each level across the site taxonomic categories range from 19 to 46, most of these being non-mammalian taxa. Thus, interpretation of the contribution of small reptiles, amphibians, and birds is speculative at best. Nevertheless, the presence of these creatures indicates a rich and varied ecosystem and excellent preservation factors which enabled the survival of their remains.

The amount of bone resulting from this remarkable preservation is put in perspective by comparison with Block 1 at 41DN20, which is practically the same size (5 x 6 m) but which yielded only 62 fragments. Excavations at each of the other three sites in the mitigation phase at Lewisville Lake were almost twice as extensive in cubic meters of matrix processed, yet these sites produced less than one-third each as much animal bone as 41DN372. Proportionally, no more fine-screening of matrix was performed at 41DN372 (23% of units) than at the other sites.

Eighty-six percent of the faunal remains come from midden areas and features associated with the Late Prehistoric artifacts. The frequency by level of animal bone and the proportion of it that was burned is illustrated in Figure 8.9. Only one identified bone was found in the Late Archaic feature (Feature 10), and this was a fish scale. Therefore, the following commentary will concern the Late Prehistoric component at 41DN372. The animals associated with each feature are listed in Table B372.1.

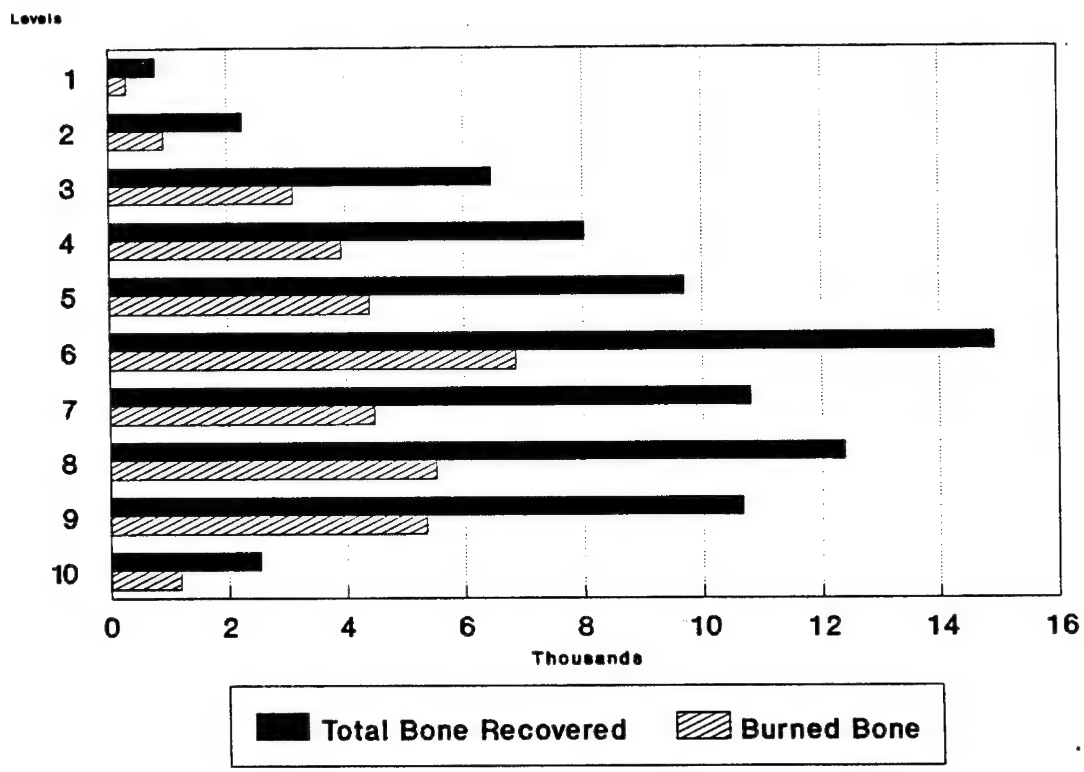


Figure 8.9 Faunal summary, 41DN372, Block 1.

Table 8. 8 Faunal Remains from 41DN372. Block 1

	LEVEL										
	1	2	3	4	5	6	7	8	9	10	Total
BOWFIN			1		1						2
GAR			3	5	10	11	6	7	10	2	54
CATFISH	3	4	15	19	23	41	20	19	38	4	186
DRUM			2	1	1	5	1	7	2		19
BASS/SUNFISH	2	1	11		2	5					21
INDET. FISH	7	20	42	50	105	191	171	214	239	36	1075
TOAD/FROG	2	2	2	4	5	4	2	5	9	1	36
TOAD	1		1					1			3
SALAMANDER			1								1
MUD TURTLE			27	2			1				30
MUSK TURTLE			3	9	3	4		2	2		23
MUSK/MUD TURTLE		3	1	4	8	8	17	18	12	4	75
SNAPPING TURTLE					1	2		3			6
SLIDER TURTLE		2	2	2	2	6	8	13	10		45
BOX TURTLE	16	19	18	43	77	149	248	678	77	6	1331
SOFTSHELL TURT		1	4	3	7	9	18	27	34	8	111
INDET. TURTLE	111	271	658	932	1160	1910	1434	1813	1560	355	10204
RAT SNAKE								5			5
WATER SNAKE						1	4	1	17		23
cf BLACK RACER									1		1
NON-VEN SNAKE		5	3	10	5	11	6	24	43	10	117
RATTLESNAKE				2							2
COPPERHEAD			2	1			10				13
VIPER			24	8	1	8		9	15	1	66
INDET. SNAKE	8	9	50	20	21	27	34	74	101	50	394
cf GLASS LIZARD					1		1		1		3
WHIPTAIL			1	3	3						7
INDET. LIZARD		2	1	3	3	8	1	1	1		20
DUCK							2	1			3
PRAIRIE CHICKEN			1					1	1		3
TURKEY					1						1
WOODPECKER			1								1
cf BUNTING		1									1
INDET BIRD SMALL			1		1	2		1	1		6
INDET BIRD MEDIUM		1	2	1	1	3	4	1	3		16
INDET BIRD LARGE		1	1	1	1	1	1	1			7
OPOSSUM		1	12	5	1	1					20
SH-T SHREW			1	2	1	1					5
MOLE				1		1		1	1		4
ARMADILLO		1	5	3	3						12
COTTONTAIL	1	21	19	13	25	46	17	52	41	3	238
JACK RABBIT		5	2	4	3	3	4	7	28	6	62
BEAVER				1		2	1	1			5
TREE SQUIRREL		1			1		3	1	1		7
GROUND SQUIRREL				1	1	1		1	5		9
POCKET GOPHER	5	4	6	12	16	27	19	23	32	7	151
POCKET MOUSE				1		3	4	4	1		13
DEER MOUSE						1					1
HARVEST MOUSE					1						1
cf. JUMPING MOUSE									1		1
RICE RAT			1						1		2
WOODRAT				1		1	2				4
COTTON RAT	6	8	10	6	14	13	1	10	15	2	85
VOLE			3	4	15	6	9	8	15		60
INDET RODENT	4	4	11	1	7	58	10	12	53		160
DOG/COYOTE					2		2	1	3	4	12
GRAY FOX				1							1
RACCOON		1			1	2	1	1			6
BADGER								1			1
MINK						1			1		2
STRIPED SKUNK	1										1
CARNIVORE			1			2				2	5
WHITE-TAILED DEER	3	10	14	12	37	61	61	41	34	17	290
DEER/PRONGHORN	4	16	18	52	64	138	143	110	120	16	681
PRONGHORN						1		1	1	1	4
COW/BISON/ELK	1		35	25	17	20	3	1			102
BISON			1			2	1	1			5
MAMMAL SMALL	4	9	35	40	87	92	73	127	58	35	560
MAMMAL MEDIUM	13	27	52	43	76	118	79	161	67	61	697
MAMMAL LARGE	6	65	279	286	373	420	141	200	249	51	2070
Total	198	515	1383	1637	2188	3427	2563	3691	2904	682	19188

The taxa and the frequency of each per level is presented in Table 8.9. The diversity of vertebrates is quite striking as the list is long, but closer inspection reveals that indeterminate turtle (shell fragments) account for fully half (53%) of the identified faunal remains. Many of the other taxa, especially the snakes and birds, are represented by one occurrence or one to two elements per level. Furthermore, a few vertebrates on the list are unlikely subsistence sources (e.g., glass lizard, shrew, mole), and the armadillo is undoubtedly a recent intruder.

Turning to species that likely contributed to the subsistence regime of these people, several of the small animals cannot be ignored. For example, although turtle shell is ubiquitous owing to its easily recognized morphology, the variety of turtle genera attests to the intensity in which these reptiles were exploited. There are six different genera identified in the assemblage as a whole. The terrestrial box turtle is the most common probably as a result of the ease in which it could be gathered. But the presence of numerous types of aquatic turtles suggest that special tactics were employed to obtain these much more elusive creatures.

Fishing also appears to have been a significant subsistence activity. This site produced more fish remains than all of the other sites investigated together. Aquatic species are more numerous in kinds and numbers of elements in the lower levels, or earlier in the occupation of the site.

Furbearing species occur in modest numbers throughout the occupation levels. Rabbits, mink, raccoon, badger, skunk, fox, and beaver demonstrate the ecotonal nature of the site location. Where cottontails and skunks inhabit the predominating edge habitats, and jackrabbits and badgers prefer the prairies, the others are bottomland or riparian dwellers. Their presence together at this site indicates the opportunities of the human hunters to exploit different habitats.

Nevertheless, it is the large game that provide the greatest reliable source of meat protein. And like the other sites in this study, deer and bison were the choices, even though other species considered to be large game were probably available. Large carnivores such as black bear and cougar certainly inhabited this ecotone, but there may have been strong taboos against taking these animals other than ritualistic killing. Elk formerly inhabited the plains areas of most of North America, now existing in more mountainous areas as a result of land practices; in prehistoric times, however, they were much more widespread. Styles and Purdue (1984) report *Cervus canadensis* from the Cedar Grove site in southwestern Arkansas, and Shaffer (personal communication) has identified elk from Cooper Lake in Northeast Texas. Pronghorn antelope is another artiodactyl that was taken and therefore available, but perhaps at a prohibitory distance for frequent procurement.

Deer bones and deer-size fragments at 41DN372 are the dominating large mammal remains. With the exception of the extreme upper and lower levels, MNI estimates are at 2-3 deer per level. Figure 8.10 shows the carcass apportionment for each level. This site is the only one in the study in which the observed frequencies match the expected. This occurs in the two of the four levels having the most bone overall. The disproportion of non-meaty elements suggests that more individuals were actually processed or that the bones were more fragmented. This merely underscores the fact that entire carcasses were returned to the camp, processed, consumed, and disposed of on site.

A comparison of the carcass parts in each of these levels shows that actually levels 8 and 9 have the better fit in some ways with the hypothetical ideal. The ratio of metapodials to fore and hind quarters is more like what is to be expected in a complete carcass. However, more cranial elements (teeth) and fewer axial elements are indicated. This observation indicates that durable and repetitive elements like teeth survive better than less durable though repetitive elements like vertebrae and ribs.

Modification of the deer bones by fire, butchering, or tool manufacture parallels the overall frequency of total bone recovered in terms of numbers of deer bone that are burned per level, or numbers of deer bone that exhibit cut marks, and bone tool frequencies. Burned deer bone is most prevalent in levels 6 and 7. Butchering marks occur most frequently in level 7. These marks are considered multiple processing cuts in

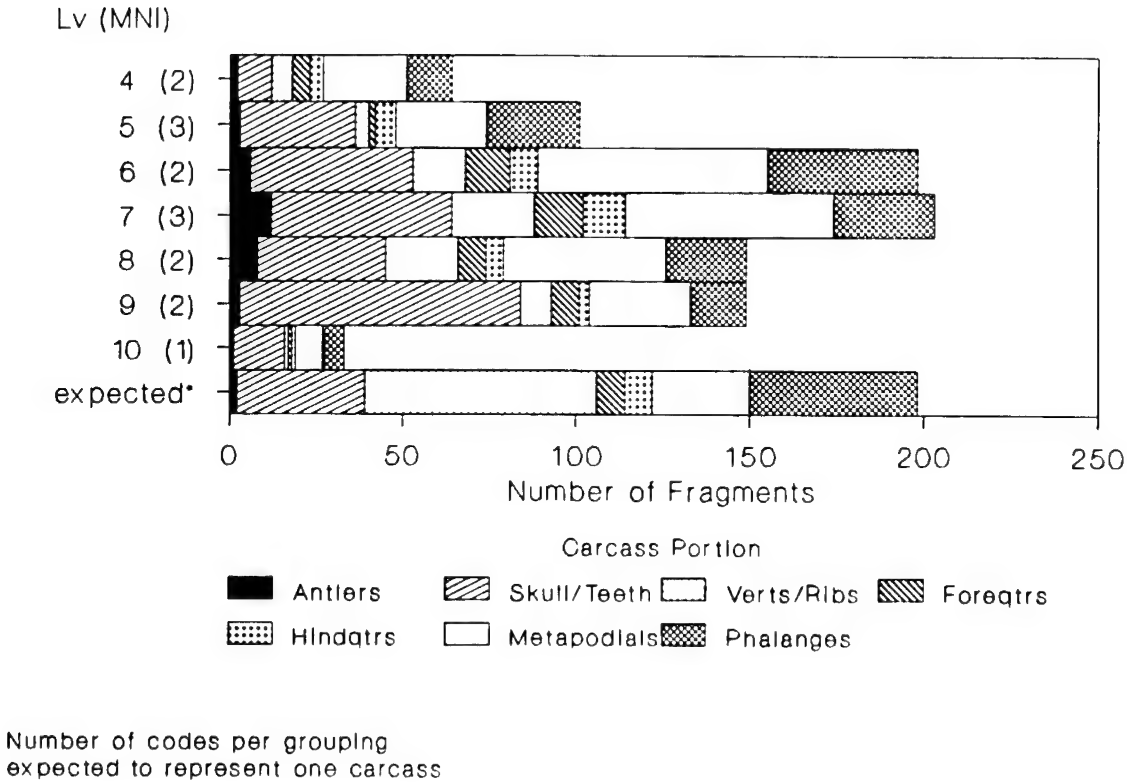


Figure 8.10 **Deer element apportionment, 41DN372, Block 1.**

which skinning and filleting cut marks appear on the same fragment or dismembering and filleting marks occur together. This pattern is quite different from that seen at the other sites.

Bone tools made from deer bones occur most frequently in the lowest of the midden zone levels, level 9, where four were recovered. There were one each in the first four levels, none in level 5, one in level 6, two in level 7, and one each in levels 8 and 10. These worked bones are mostly small fragments probably from awls. About half are burned, and the only ones that could be attributed to elements were from one ulna, one humerus, and three metatarsal fragments.

Including the 13 bone tools made from deer bone, there were 81 bone tools recovered. Deer is the only species identified, and the remainder are attributed to either large or medium-sized mammals. Twenty-three come from level 6 alone, and although none are from deer, 14 come from level 5. None are complete enough for further interpretation.

Bison remains are not abundant, with only 110 elements assigned to bison or more conservatively cow/bison/elk. In the absence of any suggestion of cow or elk in the rest of the assemblage, all 110 are logically attributable to bison. Unfortunately 86 of these elements are dentition fragments. The entire bison contribution consists of one petrous in level 1; one tooth in level 2; 36 teeth fragments in level 3; 24 teeth fragments and one phalanx in level 4; 14 teeth fragments, a scapula fragment, a radius fragment, and a carpal in level 5; ten teeth fragments, two radioulna shafts, and 1 scapula fragment, along with two carpals, four phalanges, and two sesamoids in level 6; one metacarpal, one carpal, and two sesamoids in level 7; and one tooth and one toe bone in level 8.

In summary, nine deer and one bison are minimally represented in the entire assemblage. These animals would have provided approximately 1300 lbs of meat over the course of the occupation. Even though

Table 8.9 Artifact Densities, DN372, Block 1

level	debden (n/m3)	toolden (n/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	burned bone %
1	97.5	15.0	26.5	584470	1967.5	56
2	156.0	15.0	2.4	69228	2266.0	55
3	314.0	18.0	7.4	2083	4310.7	50
4	457.1	22.9	6.2	2348	4726.5	51
5	437.7	20.9	25.9	8438	4409.5	50
6	402.1	18.3	23.2	8192	6219.6	45
7	229.7	5.0	43.4	162430	3176.8	43
8	165.7	8.3	17.0	19914	5360.4	44
9	148.9	3.9	10.3	3239	5926.1	42
10	81.3	0.0	0.0	469	3161.3	38
Mean	249.0	12.7	16.2	86081.2	4152.4	47.4
Std Dev	135.5	7.5	12.9	172984.7	1398.8	5.6

the exact number of people nourished by these animals is not realistically calculated from bones alone. It can be speculated that if only two deer where butchered per occupation episode, a band of 8 to 10 people could subsist for one month, given 8 oz. of meat per day. Drying the meat and processing marrow would extend this scenario, as would supplementation of the diet with smaller game such as birds, snakes, turtles, and mussels. The yield of a large bison would extend it even more.

Summary

Site 41DN372 contains remains from Late Archaic, Transitional LA-LP and Late Prehistoric occupations. The Late Archaic component appears to cover a larger area and is recognizable by the presence of what might be a FCR pavement or midden over a large portion of the site. In association with the FCR are a variety of stemmed and notched dart point types which are usually associated with Late Archaic occupations elsewhere in north central Texas.

The Late Prehistoric occupation appears to be more confined to the midden knoll. The midden has an extremely dense concentration of cultural debris that includes bone, lithics, ceramics, and FCR (Table 8.9). Well-preserved rock hearths, in addition to several disturbed hearths, occur within the midden deposit. A single radiocarbon age from level 7 places the Late Prehistoric II occupation at approximately 650-550 bp, or toward the beginning or first half of the Late Prehistoric II period.

The large faunal assemblage represents a very diffuse subsistence pattern on the part of the Late Prehistoric II occupants. Large numbers of smaller animals in relation to large game animals resulted in a high relative percentage of bone being identified. This, in conjunction with almost half of the unidentified bone exhibiting evidence of burning, does not fit the faunal patterns observed at other sites in the Lewisville Lake and Ray Roberts Lake areas. This new pattern is attributed to the presence of large numbers of small game

animals which would not likely have marrow and/or grease extracted from their bones. The high frequency of burned bone suggests a high efficiency in cooking and extraction of bone grease.

The small size of B 1, 5x6 m for the uppermost levels and 5x5 m for the lowermost levels, in conjunction with large numbers of well-preserved rock hearths and associated cultural refuse is not conducive to delineating intra-block specialized activity areas.

CHAPTER 9: 41DN381

Introduction

Site 41DN381 is located on a gentle colluvial slope west of the Little Elm Creek floodplain (Figures 1.2, 9.1). The site is about 150 m north of site 41DN20. Although these two sites occupy similar positions on the past landscape, there are important differences in their geologic history that explain their very different archaeological records. Whereas Early/Middle Holocene deposits are preserved above the buried Late

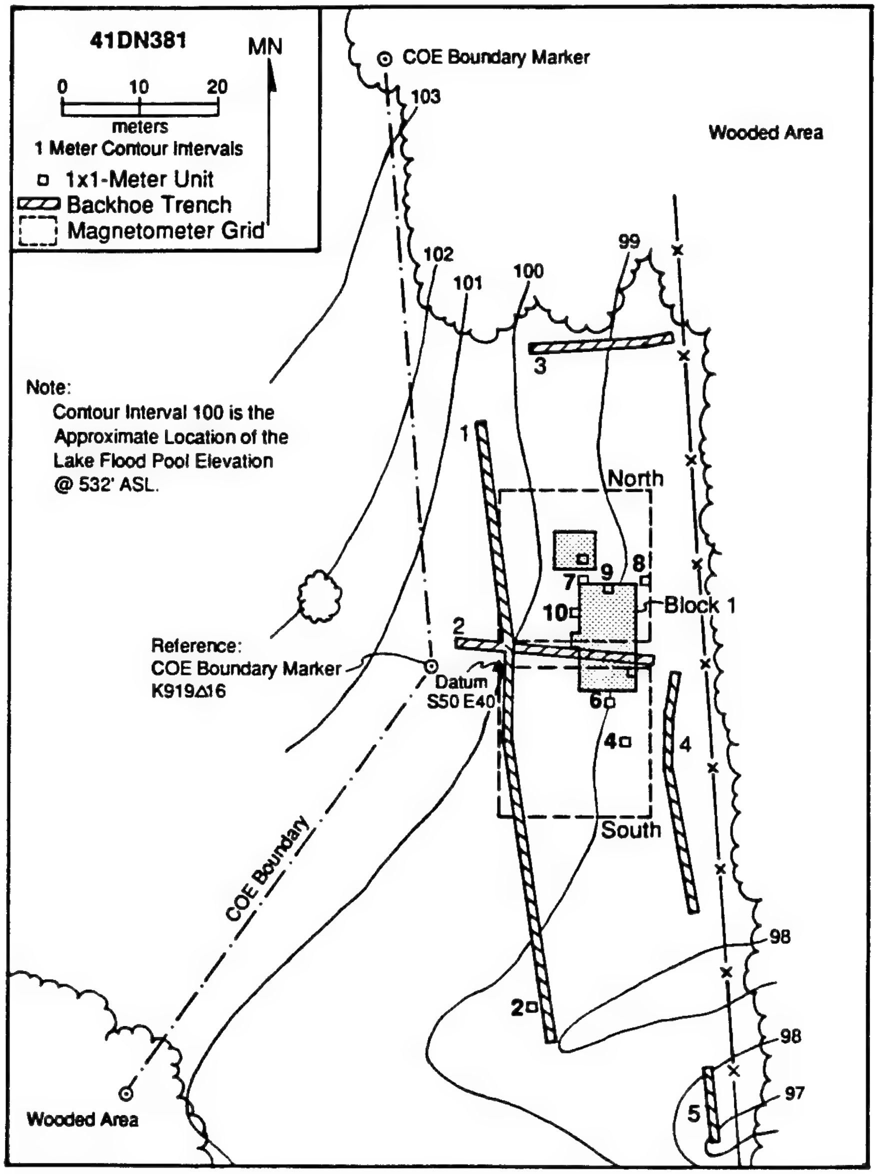


Figure 9.1 Map of site 41DN381. Site desposits are colluvium at the base of gentle slope formed on an eroded Pleistocene terrace. Floodplain of Little Elm Creek is east of fence line, under tree canopy. This site is ca. 150 m north of site 41DN20 (see Figure 1.2).

Pleistocene soil at 41DN20, erosion or non-deposition during or after the Middle Holocene is registered at 41DN381. Thus, a series of Late Holocene deposits, including colluvium and possibly some alluvium overlie a truncated B-horizon at 41DN381. These deposits contain stratified Late Archaic and Late Prehistoric archaeological materials, including features, faunas and artifacts.

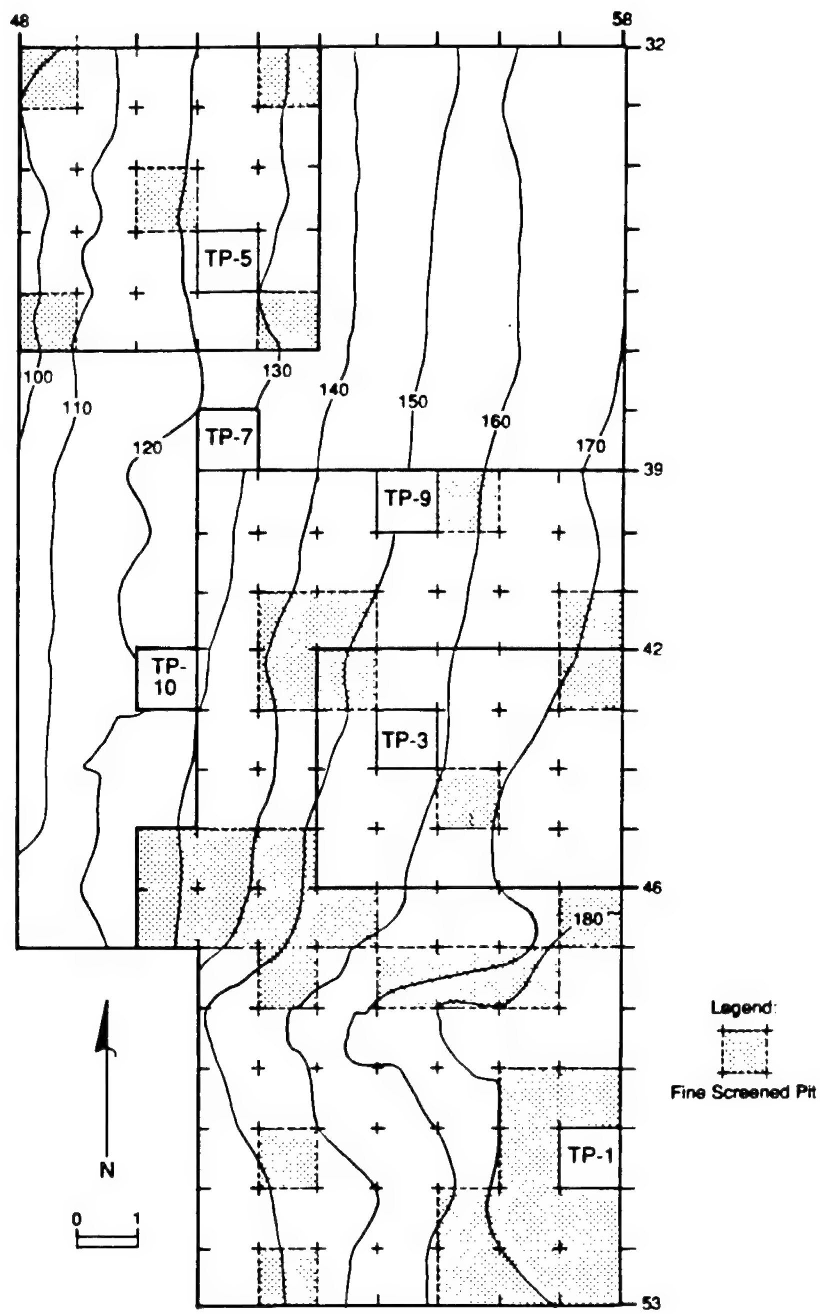


Figure 9.2 Plan of excavation Block 1 at 41DN381.

Previous Investigations

Testing consisted of five BHT's and manual excavation of 10 1x1 m TP's (Figure 9.1). TP's were excavated to depths ranging from 80-125 cm below ground surface. TP1 exposed a shallowly buried rock-lined hearth (Feature 3). A proton magnetometer survey was conducted over two 20x20 m areas of the site. Several magnetic anomalies were delineated. Subsequently, TP's were placed over several of these, resulting in exposure of three rock-lined hearths (Brown and Lebo 1992).

Projectile points recovered during testing include Kent, Ellis, Dallas, Trinity, Fairland, Wells, Yarbrough, Gary, Bonham, Fresno, and Harrell types. Well-preserved faunal remains, in addition to the features, indicated that the site could yield significant new information about Late Archaic and Late Prehistoric adaptations (Brown and Lebo 1992).

Excavation

Excavation in 1988 by UNT included a single block that was divided into two areas (Figure 9.2). The northern portion of B 1, covering 5x5 m area, was the location of initial excavations. But this part of the block was abandoned after excavation of levels 10/11 to level 15 because of the low density of cultural remains and poor faunal preservation. The reason for this situation is that this upper part of the block (hereafter referred to as "Upper Block 1" [UB 1]) is situated on an eroded surface that dips down to the east. Excavations were then shifted to the south and east, where thicker deposits were preserved, and where the proton magnetometer survey suggested the presence of buried features.

The southern, or main portion of B 1 incorporated TP's 1, 3, 7, 9, and 10 and totaled 102 contiguous 1x1 m units, including the original TP's. The majority of the block was dug through the Late Prehistoric occupation, down to level 22. This portion of Block 1, from level 16 to level 22, exposed Late Prehistoric occupation features and artifacts. This part of Block 1 is hereafter referred to as "Middle Block 1" [MB 1]. The archaeological materials in this part of the block occur in colluvial deposits in and below a buried A-horizon of a soil that formed in the colluvium (Figures 9.3, 9.4). The deposits included in MB 1 are 50-60 cm thick, and contain the densest archaeological accumulations of artifacts and also features that were recovered here. The base of these excavations in the western part of Block 1 was defined by a truncated B-horizon of a buried soil. During testing, it was revealed that the surface of this truncated soil dipped down to the east, towards Little Elm Creek. Thus, deeper Late Holocene sediments and older archaeological materials were expected in the eastern part of the 3 Block 1 area. The excavation strategy was designed to accommodate this situation, by isolating a part of Block 1 for deeper excavations.

The deeper part of Block 1 is a 4x5 m area surrounding TP 3 (Figure 9.2). This area was excavated into the deeper deposits that are inset against the sloping surface of the truncated soil B-horizon (Figure 9.5). This part of the excavations is referred to as "Lower Block 1" (LB 1). This included levels 23-32, which revealed Late Archaic occupation materials.

Five 1x1 m units were selected in the northern portion of the block for fine screening and 30 1x1 m units were selected for fine screening in the southern portion of the block (Figure 9.2). Fourteen features, in addition to the four found during initial testing, were delineated during excavation.

Block 1 Features

Four features, all consisting of fire-related activities, were found during initial testing (Brown and Lebo 1990). Features 1 and 2 were found in TP 5, levels 6 and 8, respectively. Both consisted of clusters of FCR and soil stains. Feature 3, found near the east end of BHT 2, was partially excavated in TP 1. Feature 4 was found in TP 9 (Brown and Lebo 1992).

The 14 features found during excavation consist of ten hearths/disturbed hearths, one small pit (Feature 5), two refuse areas/pits (Features 15 and 18), and one large soil stain (Feature 13). Each of these

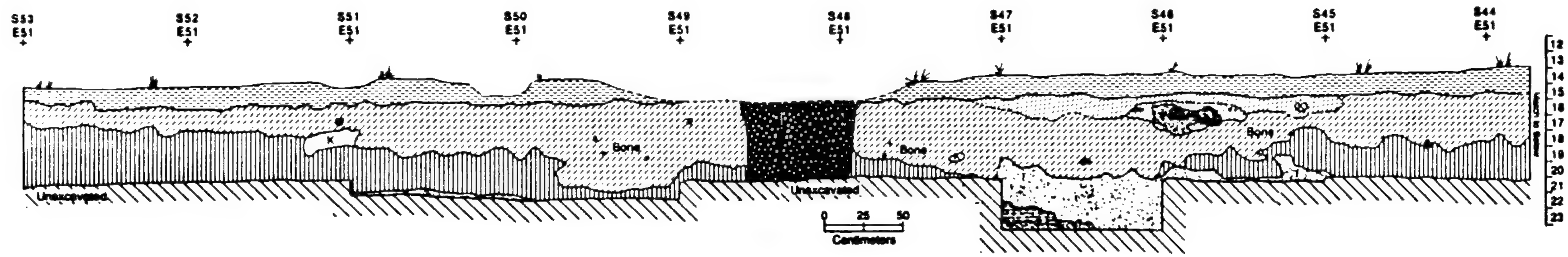
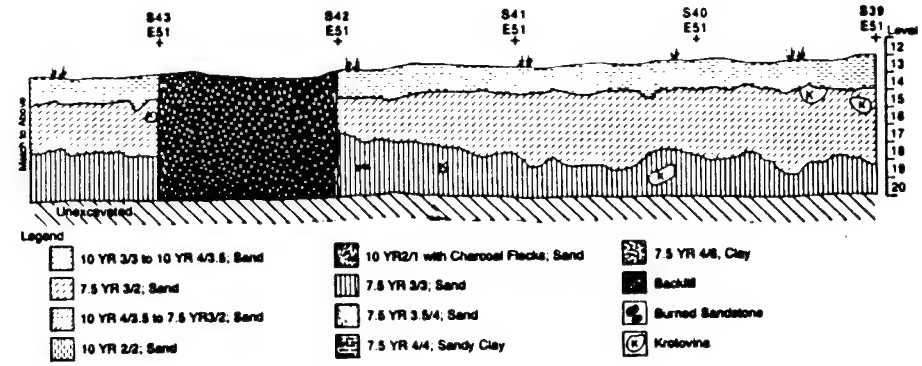


Figure 9.3 Profile of the west wall of Middle Block 1



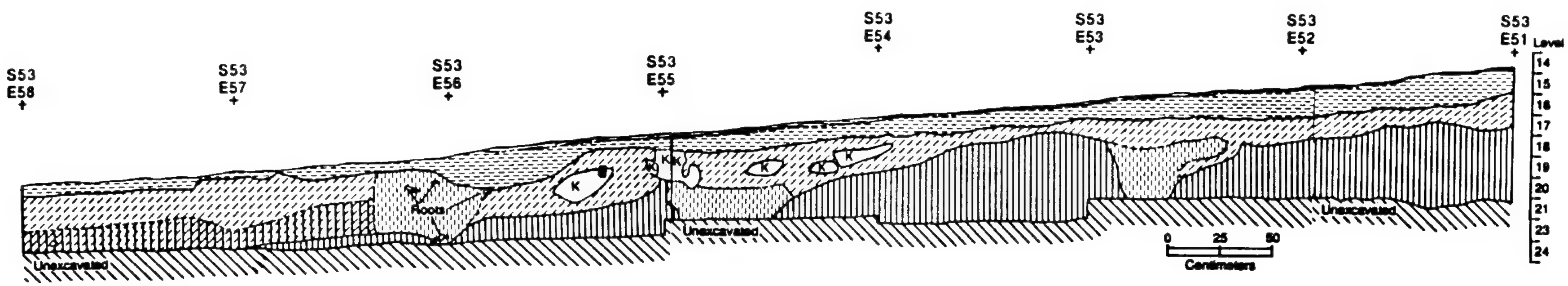
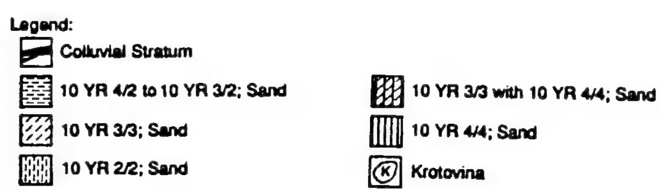


Figure 9.4 Profile of the south wall of Middle Block 1



feature types is discussed separately below. Table 9.1 shows the size and provenience of each feature recorded at 41DN381. Faunas recovered from these features are listed in Table B381.1 and B381.2.

Only one feature, Feature 2, is attributed to the earliest Late Prehistoric occupations. This feature is most likely associated with a Late Prehistoric I to Late Prehistoric II transitional occupation, possibly dating to about 800 BP. However, this is the only feature that may be associated with that occupation, and the artifact sample from those levels in the vicinity of the feature is very small.

Six features (Features 1, 4, 6, 13, 15, and 18) are attributed to a subsequent Late Prehistoric occupations, based on depth below surface and arrow point types. Eleven features (Features 3, 5, 7, 8, 9.l 10, 11, 12, 14, 16, and 17) are attributed to the last Late Prehistoric occupations of the site. Many of these features became observable immediately below the recent colluvium (derived from the slope west of Block 1) that buried the underlying dark soil that contained in situ cultural remains.

The hearths are characterized by dark soil stains that are accompanied with flecks of charcoal and sometimes burned earth, FCR, and burned and unburned bone fragments. Feature 6, measuring approximately 50x50 cm, occurred in level 15. It was not completely exposed since it was within the uncompleted northern portion of MB 1 (Figure 9.6). Feature 7, measuring 35x25 cm and occurring within level 17, was an in situ hearth with reddened earth and scattered FCR. Feature 8, measuring 55x70 cm, occurred within levels 17-18. Feature 9, measuring 90x80 cm, occurred within level 16 (Figure 9.7). This rock-lined hearth contained burned sandstone, burned and unburned bone, charcoal and a small amount of mussel shell.

Feature 10, is an unlined basin hearth measuring 40-25 cm; it contained burned earth and some mussel shell, but only one burned bone fragment. Feature 11 was located in the buried A-horizon below the plow zone. It was 90x50 cm in area and contained burned earth, charcoal, and 410 pieces of bone. Feature 12 is a basin-shaped hearth, located immediately adjacent to Feature 11. It was 110x70 cm in area, and contained burned earth, burned sandstone, ash and 73 pieces of bone, of which 48% was burned (Table B381.1). Feature 14, measuring 25x45 cm, was a cluster of FCR that appear to be related to hearth cleaning, perhaps of nearby Features 3 or 11. Feature 16 appeared to be a small, disturbed hearth with a few burned pieces of sandstone. Feature 17 was an intact rock-lined hearth within level 21. It was not completely exposed since a portion of it extended into the east wall of B 1. The exposed portion of the feature measured 100x100 cm.

Feature 5, measuring 20x25 cm and occurring within levels 13-14 (depth of 6 cm below surface), consisted of clay peds occurring within a sandy matrix. The feature appears to have been a small circular pit with an undetermined function. Features 15 and 18 appear to be refuse dumps based on the occurrence of dark soil stains, some charcoal, small fragments of FCR, and burned and unburned bone. Feature 15 occurred within levels 20-21. It was not totally exposed because it extended into the west wall of B 1. The exposed portion measured 70x60 cm. Feature 18 measured 93x85 cm and occurred within levels 21-23.

Feature 13 is a large oval-shaped soil stain that measured approximately 140x230 cm and occurred within levels 20-22. It consisted of a mottled, very dark soil stain. The stain contained small amounts of charcoal and at least two areas with clusters of charcoal flecks. The stain was almost totally devoid of FCR and other cobbles. Hearth features 9, 10, 12, 14, and 16 occur near the stain, but the activities that created feature 13 are not clear.

A total of 623.3 kg of FCR was recovered from B 1 (Table 9.2). Almost all of the FCR was associated with rock-lined hearths that occurred in levels 17, 20 and 21 (Middle Block 1). The texture of the sedimentary matrix at the site indicates clearly that all of the rocks used for hearth construction was carried into the site area.

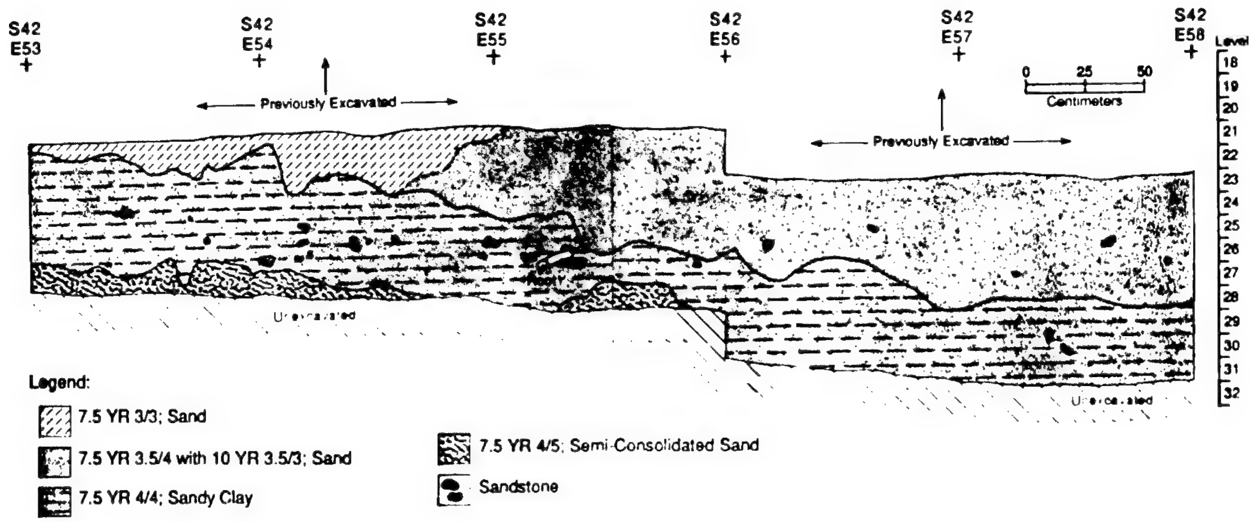


Figure 9.5 Profile of the north wall of Lower Block 1, 41DN381.

Table 9.1 Provenience and Attributes of Features at 41DN381

Feature	Type	Levels	Elevation (datum)	Depth (cm bs)	Size (cm)	Age*
1	hearth with FCR	18	175-180	55-60	20x40	2
2	hearth with FCR	20-21	196-210	76-90	52x47	1
3	rock-lined hearth	20	190-200	10-20	80x100	3
4	rock-lined hearth	19-20	180-197	40-57	40x47	2
5	pit	14	130-136	22-28	20x25	3
6	rock-lined hearth	15	143-150	38-445	50x50	2
7	rock-lined hearth	17	166-170	12-16	25x35	3
8	rock-lined hearth	17-18	161-180	18-37	55x70	3
9	rock-lined hearth	16	150-160	18-28	80x90	3
10	basin hearth	19-20	180-194	28-42	25x40	3
11	basin hearth	20-22	190-220	25-45	50x90	3
12	rock-lined hearth	20-21	190-210	27-37	70x110	3
13	stained area	21-22	200-220	50-70	140x230	2
14	hearth cleaning	19	184-190	14-20	25x45	3
15	refuse filled pit	21	200-210	56-66	60x70	2
16	disturbed hearth	19-20	180-194	10-24	20x30	3
17	rock-lined hearth	21	200-210	15-25	100x100	3
18	refuse filled pit	21-23	205-226	45-66	85x93	2

*1 = Late Archaic/Late Pre.I 2 = Late Pre. I 3 = Late Pre. II

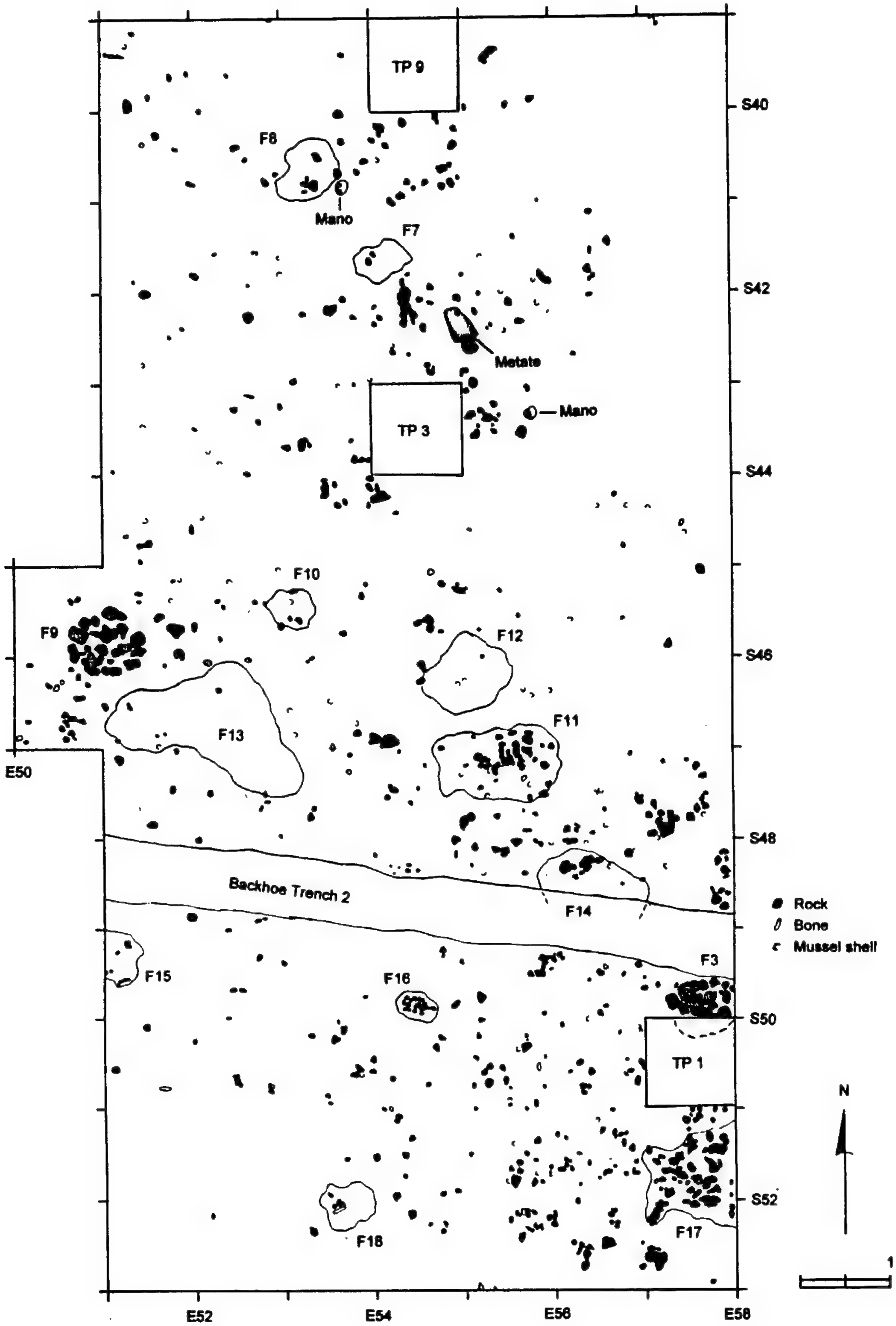


Figure 9.6 Plan of features in Middle Block 1 at 41DN381. Two features (1 and 2) in the block extension north of the main block are not shown here. See Figure 9.2.

Figure 9.7 Photograph of feature 9, 41DN381. The photo was taken when the rock-lined hearth was half exposed. See Figure 9.6 for plan of entire hearth.

Radiocarbon Ages

Two radiocarbon ages were determined on samples from MB 1. A sample of scattered flecks of charcoal from Unit (E52 S47), level 20, (near Feature 13) yielded an uncorrected age of 790±70 BP (Beta-32981). The corrected age of 693 ± BP was determined using Stuiver and Becker (1986). This would be during the transitional Late Prehistoric I to Late Prehistoric II period, or the earliest portion of the Late Prehistoric II period as defined by Prikryl (1990). As discussed later, the lithic tools and Nocona Plain ceramic assemblage from this horizon at the site appears to be compatible with this radiocarbon age.

The second age was determined on a charcoal sample from Feature 8, level 17, in Unit (E54 S41). The uncorrected age is 490±70 BP (Beta-32531), and the corrected age is 524 ± 70 BP. This would be during the middle portion of the Late Prehistoric II period as defined by Prikryl (1990).

Both radiocarbon dates appear to be reasonable for the archaeological associations at this site. No concentrations of charcoal large enough for a standard radiocarbon date were recovered from the levels representing the Late Archaic occupation. Based on projectile point types (discussed below) it is suggested that the Late Archaic occupations here would have been toward the end of the Late Archaic period.

Artifact Assemblages

A total of over 28,000 lithic artifacts was recovered from the B 1 excavations (Table 9.2). The majority of these are from levels 16-22, designated as MB 1, and derived from the principal Late Prehistoric horizons at the site. For each of the block subdivisions (upper middle and lower), projectile points are significantly more common than retouched tools, and cores and blanks occur in low frequencies. Blanks have slightly higher frequencies in UB 1, while unifacial tools and ground stone tools are somewhat more common in MB 1. For those three subdivisions of the stratigraphy, however, projectile points account for 55-60% of all non-debitage artifacts.

With respect to tool and core types and raw materials, differences between the three components are quite evident (Table 9.3). UB 1 has a small sample, and tools/cores were only found in and below level 12. Notably, no ground stone tools (save one hammerstone) were found in those levels. In MB 1, the tools include several simple scrapers, drills and burins. These tools are absent in LB 1. Use of chert for all retouched tools is remarkably high; all retouched tools were made of chert in 10 of the 14 levels bearing tools. This is higher than for any other assemblage studied at Ray Roberts or Lewisville. In complete contrast, 11 of 15 levels with blank-preforms have no chert materials for that artifact class. In exaggerated fashion therefore, this site

Table 9.2 Assemblage Composition, 41DN381, Block 1

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	GRND ST	TOTAL
10	14						14
11	76						76
12	234		3	1	3		241
13	419		1		2	1	423
14	745		1	2	7		755
15	909	1		1	3		914
16	1069	1	2	2	2	3	1079
17	2324	2	2	4	7	4	2343
18	3232		3	7	16	4	3262
19	4436			6	18	5	4465
20	4541	1	1	5	17	5	4570
21	3290		1	6	12	5	3314
22	2955	2	3	3	7	5	2975
23	869	1	1	1	5	1	878
24	822	2		3	8		835
25	658		3	1	4	4	670
26	785	1	1	4	1	7	799
27	440		2		1		443
28	349		1		3	1	354
29	289				1		290
30	148		1		2		151
31	81						81
32	38						38
TOTAL	28399	11	23	45	116	45	28639
PCT	99.16	0.04	0.08	0.16	0.41	0.16	

manifests the pattern of local reduction of local materials and import of tools/blanks of chert that has been evident at sites at Lakes Lewisville and Ray Roberts (Ferring and Yates 1997). Core raw materials include more chert in the lower levels, but these samples are quite small.

Debitage attributes reveal differences among the three components as well (Table 9.4). Chert use is highest in the UB 1 sample and lowest in the LB 1 sample. Cortical pieces decline in frequency almost regularly up through the occupational series. Large debitage is more common in LB 1 and UB 1 than in the MB 1 sample. Overall, therefore, it appears that the earlier occupations (LB 1) were characterized by production of more large cortical quartzite debitage. In MB 1, production of smaller, interior chert debitage is indicated; the fact that the majority of the tools are on chert, and that cores-blanks are not common, suggest that this is related to final tool manufacture and/or tool maintenance activities involving more imported chert tools and/or blanks. In UB 1, large interior chert pieces were generated in frequencies slightly higher than in MB 1. These data suggest that shifts, but not necessarily major shifts, in raw material procurement and processing characterize the occupations here. These ~~shifts,~~ especially in chert use, are noted within the overall Ray Roberts-Lewisville sites' tendency for chert to be disproportionately common among tools compared to cores/blanks.

The projectile point sample from the site includes about equal numbers of dart points and arrow points (Table 9.5). No arrow points were recovered below level 22, providing a logical break between the lower component (LB 1) and the middle component (MB 1). For geologic reasons mentioned earlier, the upper-most levels in Block 1 (in the separate 5x5 m part of the block [Figure 9.2]) are not stratigraphically superposed on the sediments of the main part of the block.

Table 9.3 Tools and Cores, DN381, Block 1

CLASS/type	LEVEL																		
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UNIFACIAL TOOLS																			
Retouch	1/-		2/-		2/-		6/-	5/-	2/-	5/-	2/1	1/-	2/-		3/1				
End scraper						1/-			1/-	1/-									
Thumbnail scr							1/-												
Side scraper									1/-										
Drill						1/-		1/-											
Ret bladelet						1/-													
Gouge				-/1										-/1					
Burin						1/-			1/-										
Scr. on biface													1/-						
Total	1		2	1	2	4	7	6	5	6	3	1	3	1	4				
% Chert	100		100	0	100	100	100	100	100	100	67	100	100	0	75				
BIFACE FRAGMENT			-/1	-/2	-/1	1/1	2/1	-/8	5/4	4/-	3/1	1/1	-/3		-/3	2/1		2/-	
BLANK-PRE	3	1	1		2	2	3		1	1	3	1		3	1	2	1		1
% Chert	67	0	0		0	0	0		100	0	33	0		0	0	50	0		0
CORES																			
Single plat				-/1											1/-				
Multiple plat											1/-		1/-						
Radial						-/1													
Core fragment					-/1	-/1			1/-		-/1	-/1							
Total				1	1	2			1		2	1	1		1				
% Chert				0	0	0			100		50	0	100		100				
GROUND STONE																			
Unprepared mano					1	2			1	1	2			1					
Prepared mano							2	1						1					
Unprepared metate					2	2	2	1	1	1	2			2	1				
Grooved abrader								1											
Hammerstone		1						2	3	3	1	1			6		1		
Total		1			3	4	4	5	5	5	5	1		4	7		1		

"/" = chert/quartzite

Table 9.4 Debitage, DN381, Block 1

	QUARTZITE				CHERT					INDICES		
	SMALL		LARGE		SMALL		LARGE					
LEVEL	INT	CTX	INT	CTX	INT	CTX	INT	CTX	TOTAL	Chert %	Cortex %	Large %
10	1			1					2	0.00	50.00	50.00
11	5		3		1		4	1	14	42.86	7.14	57.14
12	27	1	18	11	7	1	7	3	75	24.00	21.33	52.00
13	44	3	53	10	13		28	3	154	28.57	10.39	61.04
14	69	6	61	16	17		26	2	197	22.84	12.18	53.30
15	60	4	50	14	18	3	23	2	174	26.44	13.22	51.15
16	63	9	50	15	14		17	2	170	19.41	15.29	49.41
17	113	14	81	22	27	3	34	5	299	23.08	14.72	47.49
18	221	23	165	52	57	6	72	6	602	23.42	14.45	49.00
19	343	42	228	83	95	3	73	13	880	20.91	16.02	45.11
20	334	33	211	70	79	3	75	11	816	20.59	14.34	44.98
21	225	16	136	65	47	2	55	5	551	19.78	15.97	47.37
22	228	23	134	64	33		44	5	531	15.44	17.33	46.52
23	88	8	87	41	12		15	1	252	11.11	19.84	57.14
24	121	7	98	41	20		14	2	303	11.88	16.50	51.16
25	100	13	90	48	16		30	6	303	17.16	22.11	57.43
26	58	5	86	32	17		28	1	227	20.26	16.74	64.76
27	56	8	68	35	13		14	1	195	14.36	22.56	60.51
28	34	4	35	16	9	2	10	3	113	21.24	22.12	56.64
29	15	5	29	15	5		3	2	74	13.51	29.73	66.22
30	6		13	9	2		1		31	9.68	29.03	74.19
31	1		6	5	3		4	3	22	45.45	36.36	81.82

The sample from LB 1 includes 25 specimens, of which 17 have been classified (Table 9.5). Only one of these points is a Gary type, and the most common form is Godley (eg., Figure 9.8 h, s, a'). The rest of the sample corner-notched and both straight and expanding stemmed forms such as Kent, Edgewood, Marshall and Yarbrough. The latter has three occurrences, while all other types are represented by single artifacts. Godley and Gary types tend to co-occur the Lake Lewisville mitigation samples; at Ray Roberts sites, such as 41CO150 and 41CO144, the Godley points tend to be earlier than Gary (Ferring and Yates 1997). This sample seems to parallel that pattern. At Ray Roberts, radiocarbon ages place Godley manufacture in the ca.2,500-2,000 BP range, although the beginning and end of that range are not well defined. Clearly, however, this is a Late Archaic assemblage. The Gary point in level 23 does not necessarily signify the end of the Late Archaic; indeed, the paucity of Scallorn points in the superjacent levels of MB 1 suggests that there is probably a hiatus between the Late Archaic and Late Prehistoric occupations in this part of the site.

The Late Prehistoric assemblage in MB 1 (levels 16-22) has a dominance of Bonham-Alba points in virtually all levels. These co-occur with dart points including Gary, Godley, Elam, Darl, Dallas and others (Table 9.5). The Gary points are concentrated in the lowest Late Prehistoric levels, and some of those could possibly be culturally associated, especially with the Scallorn point in level 22. The other dart points are of suspect association with the arrow point (and ceramic) assemblage from these levels however. Erroneous associations can be the result of scavenging, bioturbation, or "lags" on eroded surfaces. Each of these is possible here. These layers generally rest on an eroded soil B horizon, and it is suspected that scavenging dart points may have been a common way to procure raw material in this region. In rapidly aggrading settings, such at Ray

Table 9.5 Projectile Points from DN381, Block 1

	LEVEL																		
ARROW PT	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Washita	1/-										1/-								
Perdiz								1/-											
Hayes						1/-													
Bonham-Alba				-/1	-/2	1/1	4/2	4/1	4/1	1/-	2/-								
Catahoula							2/-	-/1											
Fresno						-/2		2/1	1/1										
Scallorn											1/-								
Indet.		1/-				1/-	4/-	3/3	2/1	3/-									
TOTAL	1	1		1	2	6	12	16	10	4	4								
% Chert	100	100		0	0	50	75	63	70	100	100								
DART PT																			
Gary			-/2						-/1	2/1	-/1	-/1							
Godley							1/-			1/2			2/-	2/-		-/1	-/1		-/1
Elam	1/-					1/-	1/-	-/1											
Darl				-/1			1/-		1/-			1/-							
Dallas			-/1				-/1												
Kent									-/1					-/1					
Edgewood	1/-		-/1										1/-						
Marshall																		1/-	
Morrill									-/1										
Castroville												1/-							
Carrollton									1/-										
Trinity											-/1								
Yarborough				-/1								1/-			-/1		-/1		
Calf Ck tang														1/-					
Indet.		1/-	1/2				1/-	-/1	-/2	-/2	1/-	-/1	1/4				-/1		1/-
TOTAL	2	1	7	2		1	4	2	7	8	3	5	8	4	1	1	3	1	2
% Chert	100	100	14	0		100	75	0	29	38	33	60	50	75	0	0	0	100	50

"/" = chert/quartzite

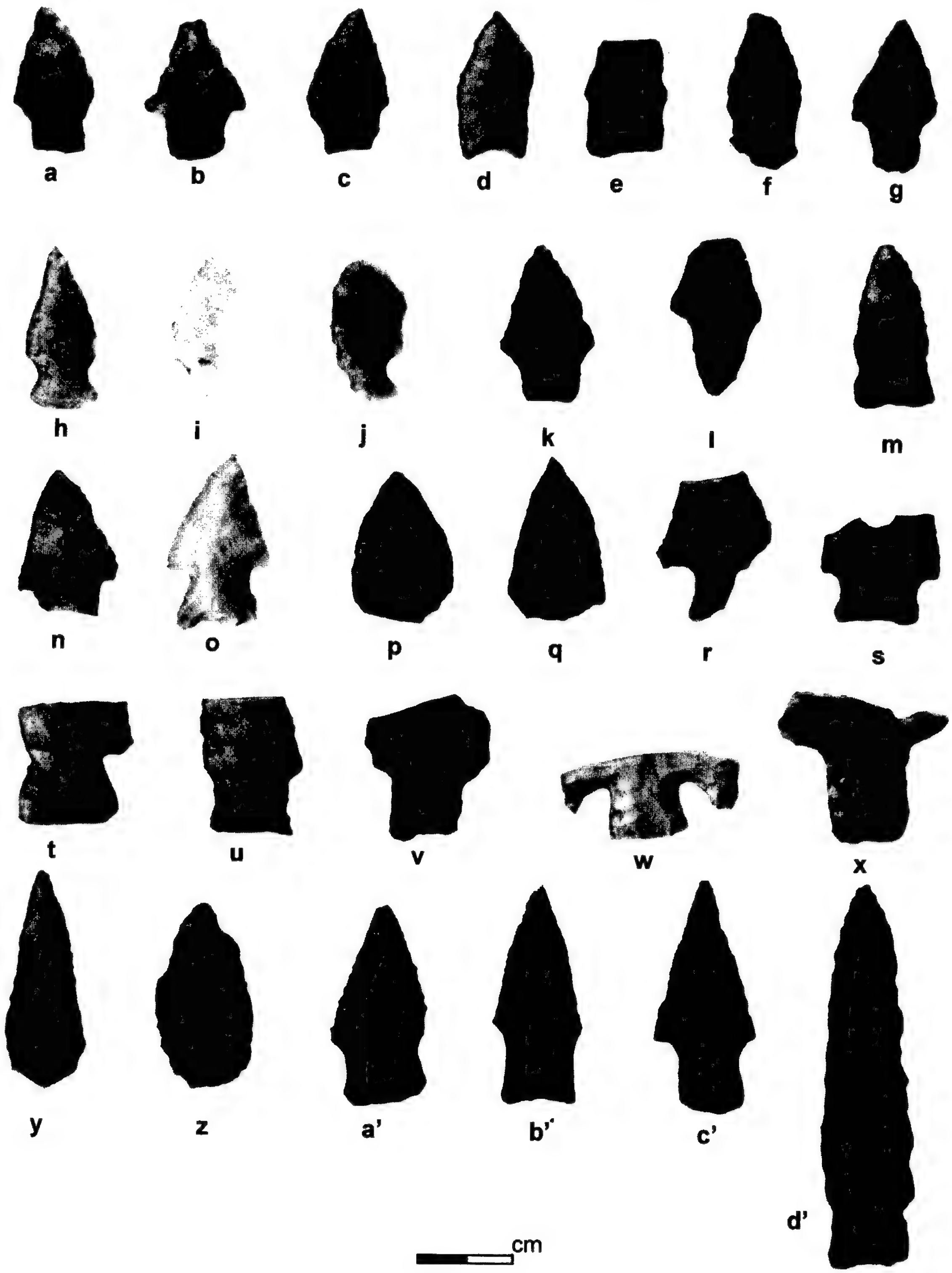


Figure 9.8 Dart points from 41DN381. a (18), b (14), c (14), d (23), e (15), f (23), g (20), h (21), i (20), j (14), k (25), l (21), m (22) , n (21), o (29), p (16), q (21), r (34), s (15), t (29), u (26), v (28), w (23), x (24), y (14), z (18), a' (25), b' (28), c' (20), d' (20) [(x) = block level].

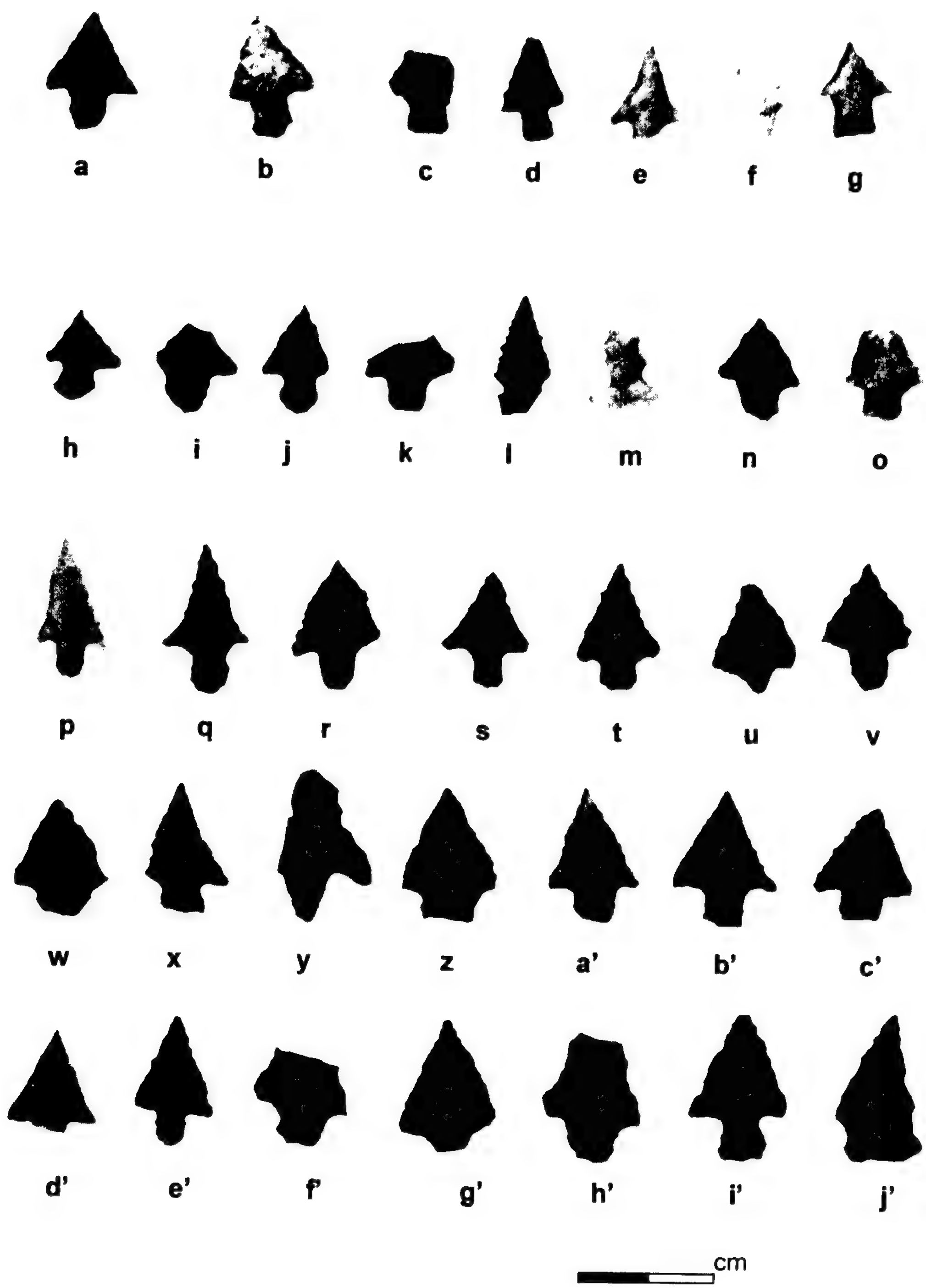


Figure 9.9 Arrow points from 41DN381. a (20), b (19), c (19), d (21), e (22), f (20), g (18), h (19), i (17), j (19), k (25), l (12), m (22) , n (17), o (15), p (19), q (18), r (16), s (18), t (18), u (18), v (16), w (19), x (20), y (19), z (21), a' (18), b' (12), c' (18), d' (19), e' (22), f' (20), g' (18), h' (20), i' (21), j' (21) [(x) = block level].

Roberts, It is usually Gary points that are associated with arrow points in stratified settings, such as 41CO141, 41DN103 and 41DN197 (Ferring and Yates 1997). Those sites suggest that Scallorn are the first common arrow points in this area, but that Bonham-Alba, Catahoula and even Washita were added to the repertoire very soon afterwards. None of those sites have ceramics, but they appear to be briefly occupied camps that were probably inhabited by people that made and used ceramics at other sites in their settlement system. Thus, this assemblage from 41DN381 seems to probably be from the middle to later part of the Late Prehistoric; implicit here is that the neat division between "LP I" and "LP II", as proposed by Prikryl (1990), probably does not match up with excavated reality, using Ray Roberts and Lewisville data. Here, as at Ray Roberts sites such as 41DN103 and 41CO141, Washita and Fresno points occur "early" with Bonham-Alba and Catahoula forms. In Oklahoma Plains Village contexts, Washita forms occur as early as 1,000 BP (Lintz 1984). Overall, therefore, is it suggested that the Late Prehistoric occupations here probably occurred after a hiatus separating the Late Archaic, and that they took place somewhat before and during the radiocarbon ages from the site (ca.700-530 bp).

The large number of metates recovered from all levels within MB 1 is functionally significant, for this is a much higher occurrence than at any of the other sites studied. The large size of these metates, many of which were made on sandstone slabs, suggests repeated and/or prolonged food preparation tasks employing these implements. Whether they signify intent to reoccupy the sites and reuse the metates is open to speculation.

The ceramic assemblage from B 1 consists of 51 sherds of which one is a rim fragment, two are probable basal fragments based on thickness, and two are possible pipe bowl fragments (Table 9.6). Types of tempering material includes crushed mussel shell (69%), sand/shell (25%), sand (3%), and no temper (2%). With the exception of two body sherds, all have plain, smoothed exteriors and interiors. Those with shell temper are classified as Nocona Plain. The two decorated body sherds, with sand and possible leached shell temper, have smoothed surfaces and shallow parallel incised lines. These two sherds appear to be from the same vessel. They were recovered from Units E54 S46 and E55 S48 in level 18.

Table 9.6 Ceramics from 41DN381

Level	Vessel sherds	Pipe fragments
11	-	
12	-	
13	-	
14	-	
15	2	
16	5	
17	9	1
18	13	
19	7	
20	6	
21	5	1
22	2	
23	1	
24	-	
total	51	2

One shell-tempered body sherd has a bi-conical hole drilled from both surfaces, probably as a repair. It was recovered from level 17 within unit E54 S48. The single rim sherd, which is a straight rim with a rounded lip, is tempered with crushed mussel shell, some of which has been leached from the paste. It has an estimated orifice diameter of 30 cm, suggesting it was a large jar. It was recovered from level 16 within unit E52 S45.

The two clay pipe fragments are from two different pipes. Neither has recognizable tempering material. One fragment, from level 20 within unit E57 S55, is a body piece that has an estimated inside diameter of 1 cm and a wall thickness of 4 mm. The other fragment is a rim that is slightly excurvate in cross-section and has a flat lip. The rim has a thickness of 4 mm and the body has a thickness of 3 mm. It has an inside diameter of approximately 1.5 cm. It was recovered from level 21 within Feature 17, unit E58 S53.

Faunal Remains

A total of 14,376 fragments of animal bone was recovered from 41DN381. Of these, 13% have been identified to element and then to the lowest taxonomic level possible (Table 9.7). Overall, good preservation of the faunal remains allowed rather high percentages of identified elements (10 to 23% of total recovery); the exceptions are some of the levels that yielded less than 200 fragments and level 16 where it appears that many large mammal long bones were smashed beyond recognition.

Table 9 7 Faunal Remains, 41DN381, Block 1

	LEVEL																						
	10	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Total
GAR											1												1
CATFISH							1		2	1	1	1		1									6
DRUM										1		1											2
INDET. FISH									3	3	2	4				1							12
TOAD	1									1		1											3
MUSK TURTLE							1																1
SLIDER TURTLE					1																		1
BOX TURTLE							2	3	8	3	5												21
SOFTSHELL TURT.									2			1											3
INDET. TURTLE				6	10	6	55	74	94	127	99	67	12	19	14	11	5	2	1		1	4	538
INDET. SNAKE									1	3	2	2		1		1							8
LIZARD												1											1
DUCK (SHOVELER?)											1	1											2
MOLE											1	1											2
COTTONTAIL					1	1	4	5	19	25	16	22	2	3	4			1					93
JACK RABBIT										1	1												2
SWAMP/JACK RABT										1													1
TREE SQUIRREL									1		1	1	1										3
BEAVER									1					1									1
POCKET GOPHER							8	4	7	8	3	5	3	1	2	2		1					35
POCKET MOUSE										1													1
DEER MOUSE											1												1
COTTON RAT							1									2							1
VOLE											1	3											4
INDET. RODENT								1	3	3	3	7	2			1							17
DOG/COYOTE											1												1
BADGER											1												1
CARNIVORE									1														1
WHITE-TAILED DEER						1	7	14	15	17	12	18	4	2	2	3	2						84
DEER/PRONGHORN		1	2	4	3	2	16	29	33	39	20	20	3	5		2	1						169
COW/BISON/ELK				1	7	4	9	11	9	4	6	4	3				1		1				55
BISON							1		1	3	2												7
MAMMAL SMALL			1		1	4	12	10	28	35	32	18	2	13	3	7	6	5		2			141
MAMMAL MEDIUM		1	3	7	7		14	11	25	37	50	23	12	9	3	6	5	4	3				178
MAMMAL LARGE					5	9	25	17	37	43	46	53	1	15	16	6	9	7	1				235
Total	1	2	6	18	35	27	156	179	290	356	308	254	45	70	44	42	29	20	6	2	1		1632

A substantial increase in amount of bone, however, seemed to begin in level 17, peak in levels 20-21, and drop off sharply in level 23, which begins the levels attributed to the Late Archaic component (Figure 9.10).

Following this same pattern, the number of identified taxa is greatest after the LA-LP transition zone (Figure 9.10) where 30 categories represent an assortment of fishes, turtles, snakes, a duck, and 14 mammalian genera/species. Even though bone counts are lower in the Late Archaic levels than in later components, the percentage of identified to unidentified bones is higher. This is not expected from faunal remains that have been subject to taphonomic factors for a longer period of time.

Given that charred bone may preserve better than unburned bone, it is conjectured the higher percentage of burned bone within the Late Archaic levels results from this preservation factor. Another factor involved in this stratigraphic difference in the relative frequency of identified bone is the probability of bone grease rendering in the later components. Bone grease rendering results in greater fragmentation of individual bones, and boiling leaves the bone more friable; therefore, fewer elements would survive to be identified.

Table 9.8 lists the fauna identified from this site by major components, with the Late prehistoric divided at level 20 owing to the very high density in levels 20-22 (very few taxa are present in levels 12-15, derived from UB 1). The assemblage is typical of prehistoric sites in North central Texas in that deer, rabbit, and turtle predominate in numbers of individuals represented as well as numbers of elements (NISP). The variety of aquatic forms (fishes, turtles, duck, beaver) is noteworthy in that few other sites have such diversity. Numerically, the indeterminate turtle category appears to represent nearly one-third of the assemblages for the Late Prehistoric components, but these counts are inflated by the ease of recognizing turtle shell fragments. Nevertheless, the diversity of turtle genera indicates that these vertebrates played a significant role in the subsistence of each occupation.

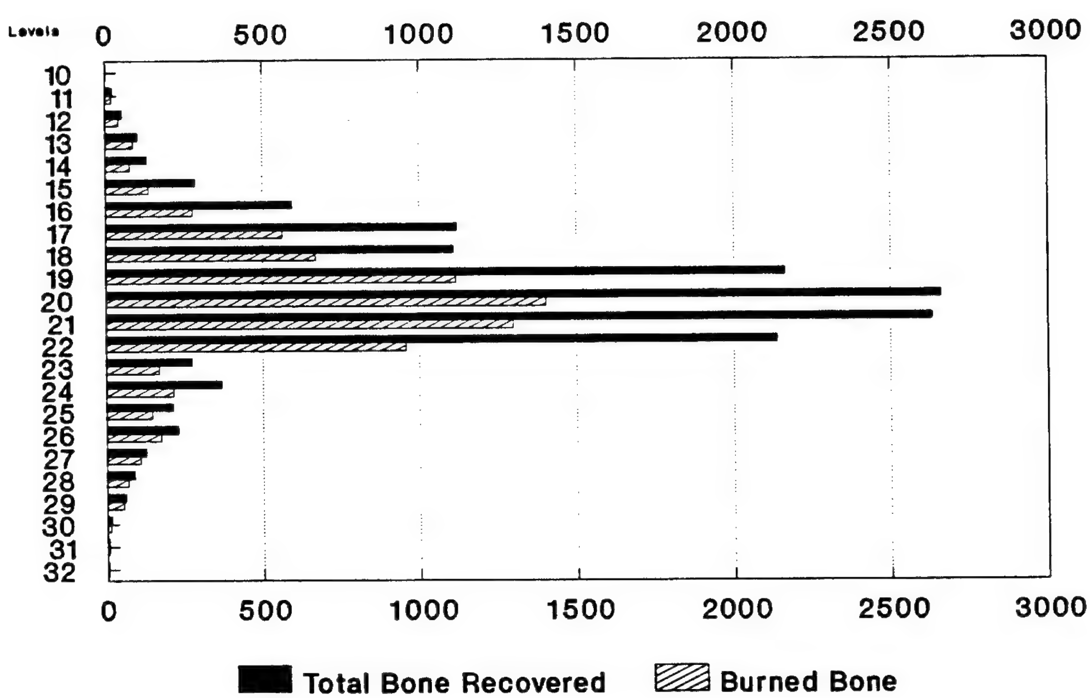


Figure 9.10 Faunal summary, 41DN381.

Table 9.8 Faunas by Archaeological Component at 41DN381

TAXON	Late Archaic	LPI / LPII	LP II	n
GAR		1		1
CATFISH		6	1	6
DRUM		2		2
INDET. FISH		12	1	12
TOAD	1	2		4
MUSK TURTLE		1		1
SLIDER TURTLE	1			2
BOX TURTLE		21		21
SOFTSHELL TURT.		3		3
INDET. TURTLE	16	522	69	554
INDET. SNAKE		8	2	8
LIZARD		1		1
DUCK (SHOVELER?)		2		2
MOLE		2		2
COTTONTAIL	1	92	10	94
JACK RABBIT		2		2
SWAMP/JACK RABT		1		1
TREE SQUIRREL		3	1	3
BEAVER		1	1	1
POCKET GOPHER		35	9	35
POCKET MOUSE		1		1
DEER MOUSE		1		1
COTTON RAT		1	2	1
VOLE		4		4
INDET. RODENT		17	3	17
DOG/COYOTE		1		1
BADGER		1		1
CARNIVORE		1		1
WHITE-TAILED DEER		84	13	84
DEER/PRONGHORN	10	159	11	179
COW/BISON/ELK	8	47	5	63
BISON		7		7
MAMMAL SMALL	2	139	38	143
MAMMAL MEDIUM	18	160	42	196
MAMMAL LARGE	5	230	55	240
Total	62	1570	259	1694

Figure 9.11 compares the composition of fauna by vertebrate class and the conjectured habitat exploitation patterns. The latter is based on the percentage of individuals in all taxa representing a given preferred habitat type (see Tables 2.2 and 9.7). All three components are dominated by mammalian taxa, with reptile percentages inflated by broken turtle shell fragments. Habitat exploitation is also fairly equal among habitat types for each component.

Tables B381.1-2 provide the frequencies of bone from each feature, and also list the faunal contents of each feature. Only one feature (F2) is attributed to the Late Archaic, and it contained only four bones: some deer-size elements and a snake vertebra. Of Features 1, 4, 6, 13, 15, and 18, only the last three yielded any bone. Feature 13 was large, but produced very little in the way of faunal remains. Features 15 and 18 were suggested by the excavators to be refuse pits, but like F13, relatively little bone was recovered from either. It is important to point out, however, that most of the bone from F15 and F18 was unburned and unidentifiable, suggesting that the osteological component of this feature might be residue from bone grease rendering. In contrast, most of the bone-yielding features affiliated with the Late Prehistoric levels (F3, 7, 9, 11, 12, 14, 16, 18) contained nearly equal amounts of burned and unburned bone.

As Table B381.2 indicates, F7, 9, and 11 contained more bone than all other features combined. These three features happen to be among the smallest features uncovered at the site. In fact, 68% of all identified bone from features came from the later Late Prehistoric features (F3, 9, 11). There was no obvious patterning for bone within any of the features, spatially or compositionally. The taxa represented in most of the features reflect the same composition as for the site as a whole. None of the bone from any of the features appeared to have been modified in any way.

Spatially, considering only the units scattered across the block that were fine-screened, concentrations of bone existed in the center of the block in the vicinities of F9 and F11 for the LPII and Transition components. For the Late Archaic, bone was apparently restricted to the area around TP3 and in a few units 4 m to the southeast of that test pit.

Some idea of carcass utilization can be gleaned from observations of element representation for economically important species, notably cottontail and deer. For each component at this site, over half of the elements assigned to each of these species were teeth. Next in rank were metapodials, carpals, tarsals, and toe bones. It cannot be ignored that these are eminently recognizable and durable elements, but at the same time, they are also non-meaty, waste bone indicative of whole-carcass processing on site. Elements from the fore- and hindquarters were more evenly represented for deer (Figure 9.12) than for rabbit, but this may reflect a more thorough consumption of the smaller game. No vertebrae or ribs were tallied for rabbit, while articulated neck remains occurred for deer in Unit 173 (S41/E53) level 19.

Another articulated cluster was found in level 20 of Unit 165 (S50/E52) consisting of a left front leg of deer (radius and carpals). This unit and adjoining units yielded three of the four left cuneiform carpals used to estimate the number of individual deer for the upper LP component (levels 12-19). The above-mentioned cluster produced yet a fifth carpal in the next level down (level 20), herein considered the Transition component. Although these elements were not excavated as feature fill, F15 was located in the same unit, and F18 was located just 1.8 m to the southeast. Therefore, this area of Block 1 probably served as a butchering area or refuse dump, not necessarily in pits (F15 and 18), but rather dispersed more like a midden.

The greatest contribution of meat by weight is represented by remains of bison/bison-size animals. Again, the identified elements are primarily the durable non-meaty skeletal remains, but their presence in all three components indicates continued exploitation of this large, important source of protein during all periods of occupation. Spatially, there is no clustering of bison/bison-size bones; instead, they are scattered across the block in roughly the same manner as the other faunal remains.

Bone modification in the form of butchering marks was noted on four deer bones, one large bird scapula, and four unidentified deer-size fragments. All of the deer bones were from levels 20-22 and consisted of two metapodial shaft fragments with striations from either skinning or tool fabrication, a cranial fragment with

a slice cut into the shed antler pedicle, and a distal ulna fragment with a skinning cut. The bird scapula was recovered during testing in TP3 in levels associated with the Late Archaic materials. It compares in size with wild turkey and exhibits a filleting type of cut mark.

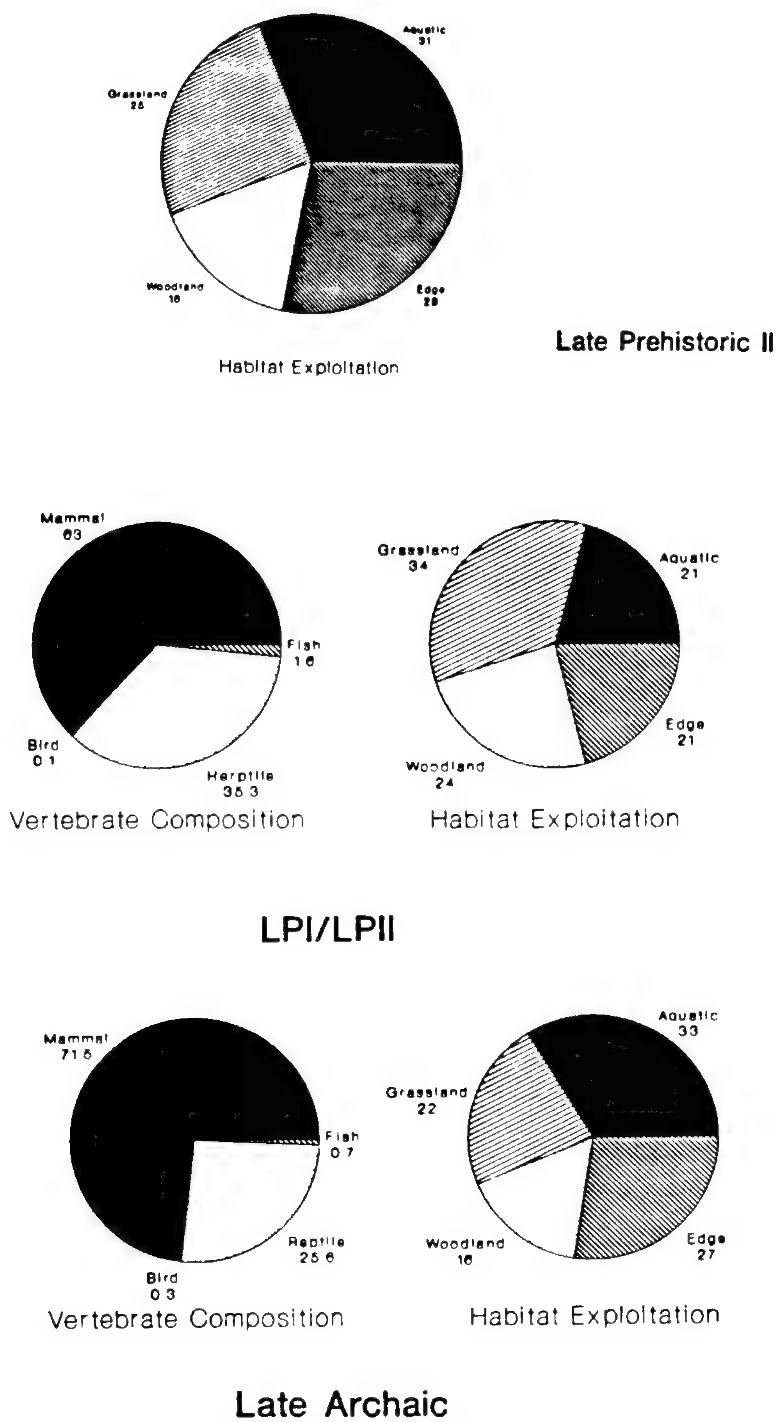
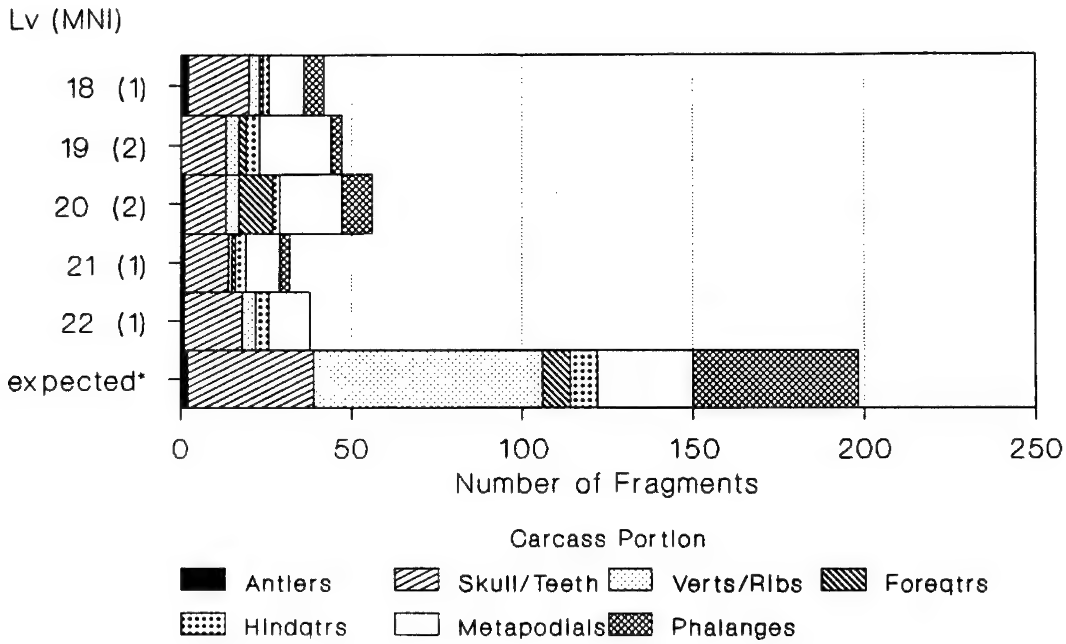


Figure 9.11 Habitat exploitation patterns, 41DN381. See Table 9.7 for data and Table 2.2 for habitat associations for the taxa.



Number of codes per grouping
expected to represent one carcass

Figure 9.12 Deer element apportionment, 41DN381, Block 1.

Bone tools were found in all three components, again primarily from levels 20-22 (Table 9.9). Nine were fabricated from large mammal long bone shafts, and four were made from deer-size shaft fragments, notably metapodial shafts. The units in the northern part of the main excavation block contained bone tools from the upper Late Prehistoric component. While no bone tools were recovered as contents of features, several of the tools related to the Late Archaic and Transition components were recovered adjacent to features in the eastern part of the Block (viz., F3, 11-14, 17).

All of the bone tools except two are broken midsections of either awls or wands (Table 9.9); striations on these specimens consistently run longitudinally. One of the exceptions is a flat, tapering tip section of an ulna awl; it is calcined and covered with fine, oblique striations. The last bone tool fragment is oval in cross-section, tapering to a ring-and-snap cut; its possible use is undetermined. All of these specimens are burned except three of the midsections made from metapodial shafts.

Only 0.74 kg of mussel shell was recovered from B 1 (Table 9.10). Most mussel shell was spatially associated with hearths. A total of 16 hinges was recovered from the entire block. Mussel densities are greatest in levels 21-22, and densities of all artifact and faunal categories are greatest between levels 16-22 (Table 9.11). An exception to this is the rather high densities of debitage and tools in the upper part of the Late Archaic component (levels 23-25). This may signify some period of slowed sedimentation and surface stability, which may also be related to the apparent hiatus between the Late Archaic and Late Prehistoric occupations here.

Table 9.9 Bone Tools from 41DN381, Block 1*

Specimen	Provenience	Component	Comment
381.69.17.2	S41/E52	LPII	fragment, B
381.98.19.2	S42/E56	LPII	ulna tip, B
381.100.20.1	S42/E58	T	fragment, UB
381.150.20.1	S47/E58	T	fragment, B
381.170.20.1	S50/E57	T	fragment, B
381.131.20.1	S44/E54	T	fragment, UB
381.131.21.1	S44/E54	T	fragment, UB, crossmends w/131.20.1
381.156.21.1	S48/E57	T	preform, B, w/ ring-&-snap cut
381.135.22.2	S44/E58	T	fragment, B
381.137.22.1	S45/E55	T	fragment, B
381.128.23.1	S43/E56	LA	fragment, B
381.100.26.1	S42/E58	LA	fragment, B
381.138.24.1	S45/E56	LA	fragment, B

*Specimen No. = site #.unit #.level #.artifact sequence #
Component = LPII (Late Prehistoric II), T (Transition LPI-LPII), LA (Late Archaic); B = burned, UB = unburned.

Table 9.10 Shell and FCR from 41DN381, Block 1

Level	Shell (gm)	Hinges	FCR (kg)
10			0.49
11			
12			
13	0.4		
14	1.5		0.27
15	27.8		
16	28.5		2.68
17	62.6	6	250.05
18	129.9	2	13.58
19	156.1	2	55.55
20	137.2	4	137.19
21	113		141.94
22	81.5	2	7.46
23	2		1.94
24	1.5		1.15
25			3.13
26			2.38
27			2.41
28			1.15
29			0.41
30			0.59
31			0.11

Summary

The large number of features, which include hearths and pits, and associated stone tools, debitage, ceramics, and faunal remains indicate the site was repeatedly occupied during the Late Archaic and Late Prehistoric periods. Two Late Prehistoric occupation series are believed to be represented. The Late Archaic component, which may contain several events that cannot be defined on the data available, occurs in the lowermost levels, 23-30, in B 1. Feature 2 is believed to represent the only feature associated with this occupation. However, since Feature 2 was observed during testing (Brown and Lebo 1992), and TP 5 was not fully incorporated into B 1 within the Archaic levels, no further assessment can be made regarding this feature.

A Transitional Late Prehistoric I to Late Prehistoric II occupation is believed to be represented in levels 20-22 and by Features 1, 4, 6, 13, 15, and 18. This is within the Late Prehistoric I to Late Prehistoric II transitional period. A second Late Prehistoric II occupation is believed to be represented in levels 12-19 and Features 3, 5, 7, 8, 9, 10, 11, 12, 14, and 16. This is within the middle portion of the Late Prehistoric II period.

Table 9.11 Artifact Densities, DN381, Block 1

level	debden (n/m3)	toolden (n/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	burned bone %
10	20.0	0.0	0.0	4860	30.0	50
11	46.7	0.0	0.0	0	73.3	86
12	62.5	3.3	0.0	0	45.0	83
13	85.6	1.1	0.2	0	57.2	88
14	103.7	4.2	0.8	139	68.9	63
15	91.6	3.2	14.6	2	149.5	50
16	94.4	2.8	15.8	1488	330.0	47
17	124.6	5.4	26.1	104189	466.3	52
18	122.9	5.3	26.5	2771	225.7	61
19	141.9	5.2	25.2	8959	348.9	52
20	131.6	5.5	22.1	22127	428.5	53
21	153.1	6.1	31.4	39428	730.6	49
22	183.1	4.8	28.1	2573	736.6	45
23	157.5	4.4	1.3	1214	171.3	64
24	178.2	6.5	0.9	676	215.9	57
25	178.2	5.9	0.0	1842	123.5	77
26	141.9	5.6	0.0	1484	141.9	82
27	121.9	2.5	0.0	1506	78.1	99
28	94.2	2.5	0.0	962	72.5	93
29	82.2	3.3	0.0	456	66.7	98
30	34.4	2.2	0.0	653	14.4	91
31	36.7	0.0	0.0	175	11.7	100
Mean	97.9	3.6	12.0	15513	191.8	60
Std Dev	26.8	1.5	11.4	31276	208.8	14

Subsistence practices focused on a broad spectrum of prairie, riparian and woodland-edge taxa. Bison are present in each major horizon at the site, but are especially common in the earlier Late Prehistoric II levels, dated to ca. 700-530 bp. In addition, deer, turtles and a variety of other small game and fish are represented. No evidence of architecture was found, suggesting a series of rather brief occupations rather than episodic or seasonal intensive use of the site area.

CHAPTER 10 PREHISTORIC ADAPTATIONS IN THE THE EASTERN CROSS TIMBERS, LEWISVILLE LAKE

Introduction

This chapter presents a summary discussion of inter and intrasite variability among the five excavated sites at Lewisville Lake. Excavations at these five sites permit the first detailed analyses of sites at Lake Lewisville based on recent excavations. Previous considerations have been made based on older avocational excavations and/or surface collections (Prikryl 1990). The small number of sites limits the range of comparative analyses, as well as considerations of settlement locations that can be addressed with excavation data. Nonetheless, the sites considered in this report are important additions to the local record, especially when coupled with the new data from Lake Ray Roberts sites (Ferring and Yates 1997).

Site Locational Patterns

A total of 86 sites with prehistoric components have been recorded within the Lewisville Lake project area (Table 3.1). Of these, 28 are multicomponent with both Archaic and Late Prehistoric materials resulting in a total of 150 components. Of the 150, 6 (4%) are Paleoindian, 55 (37%) components are Archaic, 54 (36%) are Late Prehistoric, and 35 (23%) are undetermined. Tables 10.1 and 10.2 show the occurrence of sites relative to temporal period, drainage system, and topographic setting. With regard to temporal changes in site frequencies, these data must be used with caution, since most of the sites are only roughly dated

Table 10.1 Valley Settings of Sites at Lewisville Lake

Period	Drainage	n	%
Paleoindian	Elm Fork	3	2
Archaic	Elm Fork	17	11
Late Prehistoric	Elm Fork	15	10
Undetermined	Elm Fork	6	4
Paleoindian	Hickory Creek	2	1
Archaic	Hickory Creek	8	5
Late Prehistoric	Hickory Creek	9	6
Undetermined	Hickory Creek	11	7
Paleoindian	Little Elm Creek	1	1
Archaic	Little Elm Creek	24	16
Late Prehistoric	Little Elm Creek	27	18
Undetermined	Little Elm Creek	15	10
Paleoindian	small tributaries	-	-
Archaic	small tributaries	6	4
Late Prehistoric	small tributaries	3	2
Undetermined	small tributaries	3	2

based on "diagnostic" projectile points. Because the Archaic is not consistently divided into Early, Middle, and Late and Late Prehistoric is not consistently divided into Early and Late, the possible trend of greater site frequencies for more recent components cannot be considered significant. At the same time, the abundance of Late Archaic sites and also Late Archaic tool forms in surface collections has been used to argue for higher site densities (and frequencies) for that period, compared to Middle Archaic and Late Prehistoric (Ferring 1988; Prikryl 1990).

Table 10.2 Geomorphic Settings of Sites at Lewisville Lake

	floodplain		terrace		upland	
period	N	%	N	%	N	%
Paleoindian	-	0	4	3	2	1
Archaic	-	0	29	19	28	18
Late Prehistoric	-	0	33	21	24	15
Undetermined	3	2	11	7	21	14
totals	3	2	74	49	75	49

For the 150 recorded components at Lewisville Lake, 27% are located along the Elm Fork of the Trinity River, 20% are located along Hickory Creek, 45% are located along Little Elm Creek, and 8% are located along minor tributaries of both of the above streams (Table 10.1). This places most of the components along the eastern edge of the Cross Timbers area near the border with the Blackland Prairie, or contact with the prairie grasslands. This suggests the inhabitants may have been focusing on hunting white-tailed deer rather than being centrally located within the Cross Timbers where emphasis may have been on harvesting the potentially extensive mast crop. This would have increased the amount of ecotone area bordering between the grasslands and the deciduous forests of the Eastern Cross Timbers. This site location patterning is different from that observed at Ray Roberts Lake where most components occurred within the middle portion of the Eastern Cross Timbers at a greater distance from the Blackland and Grand Prairies. The location of sites at Lewisville Lake nearer the Blackland Prairie may reflect positioning for hunting of bison which is evident at each of the Late Prehistoric sites that were excavated. In contrast, rare if any bison remains were recovered from Late Prehistoric sites at Ray Roberts Lake (Ferring and Yates 1997).

The majority of components at Lewisville Lake are situated on terraces and uplands rather than floodplains (Table 10.2). These settings simply reflect the landforms exposed around the shores of the lake. Floodplain settings were only encountered in the upstream reaches of the survey area, where site burial, especially by recent alluvium hindered survey efforts (Brown and Lebo 1990).

Settlement and Subsistence Patterns

The Lewisville Lake project area is within the Eastern Cross Timbers, but very close to the ecotone with the Blackland Prairie to the east, and not far also from the Fort Worth Prairie to the west (Figure 2.3). About 50 km farther west is the Western Cross Timbers. The marked ecological diversity, and the patchy character of woodland, prairie and riparian environments must have been fundamental aspects of the prehistoric settlement-subsistence systems.

The Cross Timbers is an environment that sustains large quantities of animals and plants not to be found in such abundance in the adjacent prairies. Concerning human occupation of the Cross Timbers,

McCormick (1976) proposed the use of this region as an avenue of seasonal migration. In contrast, Skinner and Baird (1985:5.11-13) proposed a marginal territory model for the Ray Roberts Lake area based on the paucity of sites and quantity of cultural remains at individual sites. Brown (1990) proposed three alternative models for the prehistoric settlement and subsistence patterns in the Ray Roberts Lake project domain. None of those approaches considered changes in past environments as possible controls on site frequencies or site characteristics. Further, many studies have regarded this region as "marginal" during the Late Prehistoric periods, because little evidence of strong affiliations with the Caddoan area or the Plains Village traditions was evident (Prikryl 1990; Skinner and Baird 1985; Story 1990; Lynott 1977).

Most of these studies were hampered by the lack of well-dated sites with evidence of adaptive strategies associated with temporally discrete occupations. The absence of a local record of past environments and chronological controls essentially prevented consideration of diachronic adaptive changes. Lynott's (1977, 1981) efforts were certainly aimed at an ecological approach, yet his data base was limited. And with respect to his interpretation of bison populations vis a vis past environments, his assumptions concerning grassland ecology were as flawed as those of Hall (1982, 1988) That issues will be discussed below. Prikryl's (1990) synthesis of data from the Upper Trinity River basin was earnest effort to cross date local sites with projectile point sequences defined in adjacent regions, but it necessarily could not provide conclusions based on reliable evidence of adaptations.

Here, we describe evidence from the Lewisville Lake sites for patterns of settlement and subsistence, coupled with consideration of past environments. It is still premature to come to detailed conclusions, since the reliable data base for this region is still remarkably small, despite major projects in North Texas in the last two decades (Story 1990).

Chronology

Chronological controls of the Lewisville Lake sites derive from cultural stratigraphy and the seven radiocarbon ages from four of the sites. Based on assemblage composition, the Archaic occupations at 41DN20 are attributed to the Early-Middle Archaic, based on comparisons with artifact sequences in central and East Texas (Story 1990; Pruitt 1981). Late Archaic occupations, not dated by radiocarbon, are present at each of the other four sites. Their shallow stratigraphy encumbers or even precludes definition of fully discrete occupation data as was possible at Ray Roberts (Ferring and Yates 1997). The Late Prehistoric occupations here all date to "Late Prehistoric II" if the radiocarbon ages alone are used. The range in those ages is only from 693 $\pm$ 70 to 521 $\pm$ 70 years BP. Assemblage compositions, especially the dominantly plain shell-tempered pottery and the arrow point styles, are compatible with those radiocarbon ages. Still, early and probably "transitional" Late Prehistoric occupations are present as well, especially at 41DN381 and 41DN372. At the latter site, it was suggested that transitional Archaic-Late Prehistoric occupations may be represented as well. With this possible exception, it is still not possible to identify an "early ceramic" or "Woodland" occupation at Lewisville. Thus far, considering data from Lewisville and Ray Roberts, Story's (1990) suggestion that the bow and arrow was introduced here prior to ceramic technology makes good sense.

The absence of recognizable "Woodland" or "early ceramic" occupations in this region may only be a problem of preservation and/or exposure and/or mixture in shallow sites. Regardless of the causes, the absence of such a technological transition from Archaic hunter-gatherer to village horticulture settlement subsistence systems remains one of the most striking characteristics of the record from this region, compared to woodland settings to the east as well as plains settings to the west-north. The possibility that this region was environmentally deficient in that period cannot be substantiated. Likewise, the possibility that groups in this region were completely isolated from those in adjacent regions is difficult to assume. Perhaps the people in this region simply did not adopt ceramics in preference to perishable containers. It is difficult to argue that such modest technological conservatism would delegate them to a "marginal" status. The uncommon yet repeated occurrence of southwestern materials (eg. ceramics, turquoise) in late Prehistoric sites in this region as well as the Caddoan area demonstrate at least "down the line" modes of exchange and inter-cultural awareness (Story 1981, 1990; Krieger 1946; Prikryl 1990). It seems more plausible that the groups that inhabited this region in the Late Prehistoric period were simply different than neighbors; and perhaps all of the socio-cultural

groups in this region may simply have been very conservative with respect to change in material culture.

In addition to direct evidence of subsistence in the form of faunal or floral remains other evidence including raw material acquisition, lithic technology and tool typology comprise sources of information on adaptive strategies. Prikryl (1990) is credited with analysis of lithic raw materials as a diachronic factor in local assemblage variability. He focused on relative percentages of quartzite and chert used for the manufacture of projectile points for the different temporal periods. His data are compared to assemblages from excavated, in situ sites at Ray Roberts and Lewisville (Table 10.3).

Table 10.3 Projectile Point Raw Material Types

period	Prikryl (1990)		Ray Roberts & Lewisville		Lewisville	
	local	nonlocal	local	nonlocal	local	nonlocal
Paleoindian	5	95	-	-	-	-
Early Archaic	18	82	-	-	-	-
Middle Archaic	25	75	50	50	68	32
Late Archaic	49	51	64	35	63	37
Late Prehistoric I	47	53	58	42	62	38
Late Prehistoric II	25	75	53	47	54	46

The differences between Prikryl's and UNT's results are probably explained by the fact that Prikryl assigned points to time periods based on a priori criteria, whereas UNT's samples are associated artifacts from excavations. For the Middle Archaic Period, sample sizes from Lewisville Lake and Ray Roberts Lake are small, but nonetheless are the first excavated sites from those periods from north central Texas that can be used to infer assemblage compositions and technological patterns. There is a high nonlocal raw material frequency for both Prikryl's (1990) data and Ray Roberts Lake assemblages. This suggests either large group territories (that enabled groups to encounter distant sources) and/or extensive trade in lithic raw materials.

For the Late Archaic Period, the assemblages from Lewisville Lake show greater emphasis on local quartzites while Prikryl's ratio suggests nearly equal emphasis on local and nonlocal materials. For the Late Prehistoric I Period, there is a continuation in the emphasis on locally available materials with assemblages at Ray Roberts and Lewisville Lakes having a substantially greater relative contribution of local materials (Ferring and Yates 1997). This same trend is observed for the Late Prehistoric II Period. The higher occurrence of nonlocal materials in Prikryl's Late Prehistoric II samples may be accounted for by the fact that much of his data is from nearer the West Fork Trinity River, and more importantly, perhaps, with raw material sources west of the Ray Roberts-Lewisville area.

Use of chert at Lewisville sites for major tool and debitage classes shows some of the same patterns seen at Lake Ray Roberts sites (Table 10.4). Chert debitage is most common in the early-middle Archaic assemblage from DN20. Yet all of the assemblages have chert debitage frequencies of between 12% and 31%. There is a regular increase in chert debitage through time at DN381, matching patterns at Ray Roberts, but there is no difference between Late Archaic and Late Prehistoric at DN372. Chert blank-preforms and cores are rare as well, except in the lower levels of DN381 and at DN26. None of the blank-preforms in the Late-Middle Archaic at DN20 are chert, strongly suggesting movement and curation of finished chert tools.

Table 10. 4 Chert Use at Lewisville Lake Sites

SITE levels	Phase	Debitage	Cores	Blank-Preforms	Unifacial Tools	Dart Points	Arrow Points	N*
DN381								
10-15	LP II	26	0	50	75	25	50	26
16-22	LP I-II	20	33	17	97	47	61	186
23-30	LA	16	11	11	78	69		49
DN372								
1-5	LP	12	0	22	74	0	46	162
6-9	LA	12	11	13	57	28	50	115
DN27								
3-10	LP	23	20	20	53	12	41	344
DN26	LP							
3-9		22	40	13	54	27	43	279
DN20								
28-35	MA	31	27	0	71	68		84

* core and tool sample

These chert frequencies contrast with use of chert for retouched tools and points, which almost always was higher than for cores or blank-preforms. This strongly implies importation or selective scavenging of chert for tools and tool blanks. Arrow points consistently have higher chert blanks than dart points, although DN20 has a majority of points made of chert. Chert use for points at DN381 is unusually high, especially compared to DN372.

Taken as a whole, there are certain trends in chert use through time as shown by these data, but overall there is a pattern of use of local materials for on-site manufacture of all tools, a strong dominance of chert for retouched tools, and moderate to high use of chert for projectile points. Even though there are changes through time (important ones at that), these assemblages are uniform with those from Ray Roberts in the overall moderate use of chert.

This pattern is very consistent with that shown by McGregor (1995), who contrasted raw material use between sites at Joe Pool Reservoir at farther north on the Elm Fork drainage. While similar kinds of trends from Late Archaic through Late Prehistoric were evident at Joe Pool, those assemblages had consistently high chert frequencies in the range of 90% or more. The cherts were attributed to exploitation of sources between the Trinity and Brazos drainages. McGregor noted that the differences in chert use through time by groups exploiting the Joe Pool area versus the Elm Fork area was consistent as a geographic pattern. In other words, these data suggest that raw material acquisition by Late Archaic through Late Prehistoric groups was dominated by location rather than preference. Artifact assemblages do not allow for distinction of discrete culture groups

in the Late Archaic or in the transitional Late Archaic-Late Prehistoric. But significant differences in ceramics and possibly in terms of architecture suggest that those populations may have exhibited fairly strong territoriality. Indeed, the paucity of Caddoan ceramics, or other Caddoan traits in sites from this region appears to be remarkably high given the strong patterns of localized variability that are now evident.

Assemblage compositions exhibit relatively minor variation (Table 10.5). Virtually all of the assemblages are all projectile point dominated, although 41DN26, 41DN27 and DN20 have quite high proportions of unifacial tools. Ground stone has very low frequencies except at the middle component at 41DN381, where metates and manos comprised 12% of the tool-core assemblage. These inter-assemblage differences should be compared to artifact and faunal densities (Table 10.6). In this comparison, 41DN372 stands out from the others, as might be expected from a midden mound. At the same time, this very high density profile is still very much dominated by projectile points, rather than unifaces or ground stone, which would be expected for a site with highly diverse activities. Tool diversity is actually higher for some of the low density sites, such as 41DN20, 41DN26 and 41DN27. In this regard, a greater proportion of Late Prehistoric I occupations is suggested for 41DN372. This is supported by the greater frequencies of Scallorn points and ceramics that are not shell tempered. This site also has the lowest frequency of bison, which is taken here as an indicator that climates were drier, and occupation potentials were slightly diminished (Table 10.7).

Table 10. 5 Assemblage Compositions

SITE Comp	Cores	Bl-Pre	Uniface	Dart Pt.	Arrow Pt.	Grnd. Stn.	N
DN381							
10-15	0.04	0.19	0.15	0.08	0.54	0.00	26
16-22	0.03	0.06	0.18	0.31	0.29	0.12	186
23-30	0.08	0.18	0.18	0.51	0.00	0.04	49
DN372							
1-5	0.05	0.13	0.22	0.07	0.52	0.01	162
6-9	0.08	0.14	0.14	0.17	0.44	0.03	115
DN27							
3-10	0.06	0.18	0.26	0.12	0.33	0.05	344
DN26							
3-9	0.04	0.11	0.26	0.27	0.31	0.01	279
DN20							
28-35	0.12	0.11	0.31	0.44	0.00	0.02	84

All four sites with Late Prehistoric II components at Lewisville Lake contained remains of ceramic vessels, dominated by Nocona Plain. This is quite different from the sites represented at Ray Roberts Lake where only three sites had remains of ceramic vessels. The ceramic assemblages for the five sites at Lewisville Lake are relatively small. The paucity of ceramics may indicate those components represent very short term campsites used by either all-male social groups (i.e., hunting parties) as represented at sites with no ceramics or very short term camps comprised of an entire social group as exhibited by the five sites at Lewisville Lake and three sites at Ray Roberts Lake. This pattern implies temporary seasonal use of the area.

Table 10.6 Density Summaries for Lake Lewisville Sites

	DENSITIES			
	Debitage #/m3	Tools #/m3	Bone #/m3	FCR kg/m3
SITE				
41DN381				
10-15	20-103	0-4.2	30-149	0- 4.8
16-22	94-183	2.8-6.1	225-736	2.5-104.2
23-30	34-178	2.2-6.5	14-216	.2- 1.8
41DN372				
1-5	97-457	15-20.9	1,960-4,725	2.1-584.5
6-10	148-402	3.9-18.3	3,176-6,219	3.2-162.4
41DN27				
3-10	113-183	5.3-8.6	330-1,197	0.4-64.5
41DN26				
3-9	66-113	2.1-6.4	254-615	0.6-7.3
41DN20				
28-35	33-99	0.5-13.3	0-9.5	0.05-0.4

This pattern in ceramics is somewhat different from nearby areas adjacent to and within the Eastern Cross Timbers. For example, Caddoan-style ceramics and/or influences have been recovered from the Richland Creek area (Bruseth and Martin 1987; McGregor and Bruseth 1987) and Mountain Creek area (Peter and Moir 1987). Petrographic analyses of sherds from Joe Pool and the larger region (Ferring 1987; Ferring and Perttula 1987) suggest that local imitations may have been much more common than trade wares. The occurrence of only a few sherds with Caddoan traits in the Lewisville Lake area and none from the Ray Roberts Lake area suggests either limited influences or presence of these peoples.

Subsistence data from the Lewisville sites are largely those of faunal remains, since we were unsuccessful in attempts to recover plant remains other than wood charcoal. These sites exhibit quite strong patterns of faunal exploitation nonetheless, and these patterns mirror those seen by other researchers. Most significant is the high proportion of bison in the Late Prehistoric faunas from Lewisville (Table 10.7). Bison bones increase in frequency through time at both DN381 and DN372, yet there is a consistent difference in the overall proportion of bison in those sites through time. Likewise, those sites have consistently different frequencies of box turtle through time. These assemblages are either mixed, or the sites' settings offered consistent habitat associations through time that are reflected in the kinds of fauna that were exploited.

The later part of the Late Prehistoric period is when bison frequencies are highest at Lewisville, as seen at many other sites in this region (Lynott 1977, 1981). This has been attributed to drier climates by Lynott and also by Hall (1982, 1990), who both concluded that dry conditions would favor invasion of short grasses, which in turn would allow bison to enter the region in greater numbers. Both researchers explain the higher bison frequencies with stacked assumptions. Lynott's are based on circular reasoning about bison's preferred food (short, warm-season grasses, particularly the C_4 species such as Buffalograss and its Southern Plains co-dominant, Blue grama). He assumes that an increase in bison must connote an increase in short grasses, accommodated by drier climates. Hall's climatic reconstructions, also quite circular, are based in part on pollen and molluscan data, but also on assumptions concerning geomorphic response (notably channel trenching) to climate change. Reassessment of the proxy biotic data, and ignoring the geologic presumptions, leads to quite different conclusions (Ferring 1993, 1995; Henry 1995).

Table 10.7 Summary Faunal Frequencies, Lake Lewisville Sites

SITE	DN 381			DN372		DN27	DN26
Component	LPII	LPI/II	LA	LP	LA	LP	LP
TAXA							
Aquatic turtle	5.3	0.9	0.0	8.3	5.8	0.8	2.8
Box turtle	0.0	4.8	0.0	17.1	34.7	4.8	10.8
Cottontail	0.0	20.9	23.3	7.8	4.7	6.2	3.5
Jackrabbit	0.0	0.7	0.0	1.4	1.3	0.1	0.3
Small game	0.0	1.6	4.7	1.2	0.9	0.7	0.1
Birds	0.0	0.5	0.0	1.5	0.7	1.8	0.4
Fish	0.0	4.8	4.7	32.4	29.7	6.5	7.0
Deer	52.6	55.2	55.8	22.7	21.3	40.0	53.9
Bison	42.1	10.7	11.6	7.7	0.8	39.2	21.3
N	19	440	43	1014	3321	1356	1032
% Total NISP	54.3	45.7	38.3	24.4	33.0	75.5	56.0

In essence, it makes no sense for grazing populations to increase when precipitation is decreasing. More rain should increase grazing potentials in the High Plains, where short grasses predominate today. And favorable grazing there should increase the potential for bison to encroach eastwards, either in general or during short term perturbations in food availability to the west. As shown by McDonald (1981) the gross trends in bison population on the Great Plains are rainfall controlled, and the gross patterns in bison distribution are at once numeric and latitudinal (see Ferring 1995). Isotopic data (Humphrey and Ferring 1994), pollen, microfaunal and molluscan data (Henry 1995; Holloway, Raab and Stuckenrath 1987) as well as other faunal studies (eg. Creel, Scott and Collins 1990) all point to the conclusion that Late Prehistoric bison populations were large because of overall increases in food availability stimulated by increased precipitation. In this region biomass is almost fully correlated with precipitation. The slightly reduced value of the positive correlation between precipitation and biomass is related to increases in tree cover. Thus the Middle Archaic occupations at 41DN102 have no bison although regional data suggest significantly drier climates prevailed during the Middle Holocene (Ferring 1995).

In the end, therefore, the principal point of contention with Dillehay's (1974) interpretation of bison availability on the Southern Plains was that bison were probably never "absent" in the strict sense. Both Lynott and Hall found that the archaeological record indeed points to marked changes in bison availability. According to their interpretations, bison availability (correlated with drier climate) would have to have been accompanied by net decreases in biomass and surface water availability. We cannot find support in the archaeological record for that corollary. Rather, Dillehay's original (and later Stafford's [1981]) conclusion that bison were more abundant in the Southern Plains during periods with wetter climate seems to have been quite sound all along.

Another major aspect of economic change during the Late Prehistoric was the introduction of maize, squash and beans to a mixed hunter-gatherer and horticultural strategy. Maize has been found at numerous Late Prehistoric sites in the region (see Story [1990] for the most comprehensive review). Domesticates were apparently more common in the Caddoan economies, as indicated by macrobotanical data, and also by palaeopathological data (Burnett 1990). Maize is well represented at the Cobb Pool site (Peter and McGregor

1988), although little else, except houses, indicates much reliance on gardening. Analysis of caries as indicators of carbohydrate consumption show definite increase in the Late Prehistoric period, but at the same time there are regional and intra-regional variations that cross-cut any real temporal trends (Burnett 1990). Wylie Focus folk, primarily inhabiting the Blackland Prairie habitats (Bruseth, McGregor and Martin 1995), show high caries rates indicating high carbohydrate consumption; at the same time they exhibit a variety of common pathologies indicating chronic stress (Burnett 1990). For the Lake Lewisville and Lake Ray Roberts occupations, we have no direct botanical evidence of food income. Stable isotope analysis of skeletal remains, however, provide some clues (Gill-King 1997). Analysis of stable isotopes from Middle Archaic (1), Late Archaic (2) and Late Prehistoric (4) skeletons from Ray Roberts and Lewisville showed remarkably similar patterns. All of the data indicate a diet with significant meat consumption (and/or cholostrum for infants). Both the meat and the plant foods were clearly dominated by C_3 species, eliminating the possibility that maize was a significant part of the diet. Interestingly, this pattern is the same for sites without bison (Middle Archaic) as well as Late Prehistoric sites with high proportions of bison, including both DN26 and DN27 from Lewisville.

These data allow the conclusion that those people were not eating much corn, but they were eating a lot of "cool season" plants and also animal that ate cool season plants. In an admittedly roundabout way (human bone to animal to forage) these data, while very limited, do not show any evidence that the abundant bison of the Late Prehistoric here were eating warm season grasses. Interestingly, many of the Lewisville-Ray Roberts faunas indicate frequent acquisition of aquatic species (predominantly turtles and fish, with variable clams). And most faunas are dominated by deer as well, but only in terms of the numeric frequency of bones, not in meat income. Both deer and aquatic animals would contribute almost exclusively to the lighter (C_3) isotopic component seen in the skeletons from these sites. The lack of significant isotopic variation in these skeletons is probably not explained by consistent dietary practice, but rather by exploitation of a changing array of C_3 plants and animals that also ate C_3 plants. Particularly in the Late Prehistoric period, those animals included bison.

This overall pattern suggests that peoples in this region exploited whatever was available to them, and possibly did so within quite well-defined territories. Life was rigorous and large sedentary communities were probably never common if they existed at all. Two sites may be attributed to more permanent occupations. First, minimal excavations at the Hackberry site, 41DN57 (Barber 1969) revealed storage pits and bison scapula hoes that suggest a more permanent camp. Another site, also inundated by the lake, is site 41DN386 (Brown and Yates 1990). This site, although only tested along the present shoreline and appearing to have been mostly destroyed by wave action, contains large quantities of formal chipped and ground stone tools that have similarities with those associated with Southern Plains village cultures. Nonetheless, those peoples persisted, with their own adaptive strategies that worked through several thousand years of environmental change and contacts with both near and distant neighbors. In this sense the "unknown cultural affiliations" and "marginal" lifeways of these people, so often cited in the literature, seem quite inappropriate.

Conclusions

The present evidence indicates, that at least for the Late Archaic, Late Prehistoric I, and Late Prehistoric II periods, local populations were part of autonomous cultural traditions and culture groups. Sociocultural changes in the area may have been the result of stimulus diffusion from external cultural traditions, although evidence for this is very weak. This stimulus diffusion could have occurred as a result of use of the northern portion of the Eastern Cross Timbers between the Caddoan and Southern Plains peoples. The changes exhibited in the archaeological record within the Lewisville Lake and Ray Roberts Lake areas is essentially homeostatic change in response to climatic and cultural conditions rather than evolutionary change. The absence of pottery other than that attributed to the Late Prehistoric II period suggests the habitual use of ceramic vessels in the area occurred at a later time than that expressed in the archaeological record found slightly further east, north, and southwest. This suggests the habitual use of ceramic vessels in the northern portion of the Eastern Cross Timbers is out-of-phase with its use in surrounding areas during the Late Prehistoric I period. This pattern in ceramic occurrence is most evident in the absence of recognizable Woodland complexes similar to those found in northwest Texas, eastern Oklahoma and Texas, and western

Arkansas and Louisiana.

While there is some evidence to indicate an increase in resource availability during the Late Prehistoric II period, stimulated by climatic change, there is little evidence thus far that this stabilized culture groups as indicated by decreased mobility, increased specialization of patch exploitation, or decreased diversity of floral-faunal resource procurement practices.

REFERENCES CITED

Albert, L.E.
1981 Ferndale Bog and Natural Lake: five thousand years of environmental change in Southeastern Oklahoma: Norman, Oklahoma Archaeological Survey, Studies in Oklahoma's Past, 7.

Antevs, E.
1955 Geologic Climatic Dating in the West. American Antiquity 20(4):317-335.

Baerreis, D.A. and R.A. Bryson
1965 Climatic Episodes and the Dating of the Mississippian Cultures. The Wisconsin Archaeologist 46(4):203-220.

Banks, L.D.
1983 Major Chert Sources in the Jackfork and Brushy Creek Basins. In Bug Hill: Excavations of a Multicomponent Midden Mound in the Jackfork Valley, Southeast Oklahoma. Ed. by J.H. Altschul, pp. 335-365. New World Research Report of Investigation No. 81-1. Report submitted to the U.S. Army Corps of Engineers, Tulsa District.

1984 Lithic Resources and Quarries. In Prehistory of Oklahoma edited by R.E. Bell, pp. 65-95. Academic Press, New York.

1990 From Mountain Peaks to Alligator Stomachs: A Review of Lithic Sources in the Trans-Mississippi South, the Southern Plains and Adjacent Southwest. Memoir 4, Oklahoma Anthropological Society. Norman.

Barber, B.L.
1966 The Irish Farm Site, 18C4-2. The Record 22(2):9-14.

1969 The Hackberry Site. The Record 25(3):18-24.

Barber, B.L. and P. Lorrain
1984 A Burial at the Hackberry Site. The Record 40(1):6-7.

Barnes, V.E.
1967 Geologic Atlas of Texas, Sherman Sheet. Bureau of Economic Geology, University of Texas, Austin.

1988 Geologic Atlas of Texas, Dallas Sheet. Bureau of Economic Geology, University of Texas, Austin.

Bell, R.E.
1958 Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society Special Bulletin No. 1. Oklahoma City.

1960 Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society Special Bulletin No. 2. Oklahoma City.

1984 (ed.) Prehistory of Oklahoma. Academic Press, New York.

Binford, L.R.
1967 Smudge Pits and Hide Smoking: The Use of Analogy in Archaeological Reasoning. American Antiquity 32(1):1-12.

1981 Bones: Ancient Men and Modern Myths. Academic Press, New York.

1982 The Archaeology of Place. Journal of Anthropological Archaeology 1 (1): 5-31.

Binford, L.R. and G. Quimby
1963 Indian Sites and Chipped Stone Materials in the Northern Lake Michigan Area. Fieldiana-Anthropology 36:277-307.

Blair, W.F.
1950 The Biotic Provinces of Texas. Texas Journal of Science 2(1):93-117.

Borchert, J.R.
1950 Climate of the Central North American Grassland. Annals of the Association of American Geographers 40:1-39.

Bousman, B. and L. Verrett
1973 An Archaeological Reconnaissance at Aubrey Reservoir. Archaeology Research Program, Southern Methodist University, Dallas. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

Bray, R.T.
1963 Comments on the Pre-Ceramic in Missouri. Plains Anthropologist 8(22):231-237.

Brown, D.O.
1988 Prehistoric Subsistence Strategies in Northeastern Central Texas. Bulletin of the Texas Archeological Society 59:201-244.

Brown, K.L., and S.A. Lebo
1991 Archaeological Testing of the Lewisville Lake Shoreline, Denton County, Texas. Institute of Applied Sciences, University of North Texas, Denton. Submitted to U.S. Army Corps of Engineers, Ft. Worth District.

Brown, K.L. and B.C. Yates
1990 Prehistoric Site Descriptions. In, Archaeological Testing of the Lewisville Lake Shoreline, Denton County, Texas. Edited by K.L. Brown and S.A. Lebo. Institute of Applied Sciences, University of NorthTexas. Report submitted to the Fort Worth District U.S. Army Corps of Engineers.

Brown, K.L., C. R. Ferring, and B.C. Yates
1990 Prehistoric Site Excavations at Ray Roberts Lake, draft Denton, Cooke, and Grayson Counties, Texas. Institute of Applied Sciences, University of North Texas. Report submitted to the Fort Worth District U.S. Army Corps of Engineers.

Bruseth, J.E. and W.A. Martin (editors)
1987 The Bird Point Island and Adams Ranch Sites. Richland Creek Technical Series, Vol. II. Archaeology Research Program, Southern Methodist University, Dallas.

Bruseth, J.E., D.E. McGregor and W.A. Martin
1987 Hunter-Gatherers of the Prairie Margin: Summary of the Prehistoric Archaeological Record. Richland Creek Technical Series, Vol. III. Archaeology Research Program, Southern Methodist University, Dallas.

1995 Huinter-Gatherer Adaptations along Richland Creek, North-Central Texas. In, Advances in Texas Archaeology, Contributions from Cultural Resources Management (J.E. Bruseth and T.K. Perttula, editors). pp. 5-50. Texas Historical Commission, Austin.

Bryant, V.M., Jr, and R.G. Holloway

1985 A Late-Quaternary Paleoenvironmental Record of Texas: An Overview of the Pollen Evidence. In Pollen Records of Late-Quaternary North American Sediments. Edited by V.M. Bryant, Jr. and R.G.Holloway, pp. 39-70. American Association of Stratigraphic Palynologists Foundation, Dallas.

Bryson, R.A., D.A. Baerreis and W.M. Wendland
1970 The Character of Late-Glacial and Post-Glacial Climatic Changes. In: Pleistocene and Recent Environments of the Central Great Plains. Edited by Wakefield Dort, Jr. and J. K. Jones, Jr., pp. 54-74. University of Kansas Special Publication No. 3. Lawrence.

Bryson, R.A. and W.M. Wendland
1967 Tentative Climatic Patterns for Some Late Glacial and Post-Glacial Episodes in Central North America. In: Life, Land and Water edited by W.J. Mayer-Oakes, pp. 271-298. University of Manitoba Press, Winnipeg.

Butler, B.H.
1974 Faunal Analysis. In Archaeological Research at Cooper Lake, 1970-1972, edited by Hyatt, R.D., B.H. Butler, and H.P. Mosca III. SMU Contributions in Anthropology No. 12, Southern Methodist Univ., Dallas.

1975a Faunal Remains. In Archeological Research at Cooper Lake, Northeast Texas, 1973, edited by R.D. Hyatt and K. Doehner, pp. 60-70.SMU Contributions in Anthropology 15, Southern Methodist Univ., Dallas.

1975b Faunal Analysis of the Sister Grove Creek Site. In Archaeological Excavations at Lake Lavon, Texas, edited by Mark J. Lynott, pp. 76-80. SMU Contributions in Anthropology 16, Southern Methodist Univ., Dallas.

Butzer, K.W.
1982 Archaeology as Human Ecology. Cambridge University Press, Cambridge.

Byrd, K.M.
1980 Zooarchaeological Analysis of the Hanna Site: An Alto Focus Occupation in Louisiana. Louisiana Archaeology 5:235-265.

Caran, S.C.
1990a Geomorphology of Lower Village Creek, Tarrant County, Texas. In Archaeological Investigation of the Proposed Green Oaks Boulevard Extension from IH30 to Fielder Road, Tarrant County, Texas, by S. L. Andrews and S. C. Caran, p. A1-A34. Freese and Nichols, Inc., Fort Worth.

1990b Geomorphology of Lower Village Creek, Tarrant County, Texas. In Archaeological Investigation of the Proposed Green Oaks Boulevard Extension from U.S. Highway 80 to Meadowbrook Drive, Tarrant County, Texas, by S. L. Andrews and S. C. Caran, p. A1-A29. Freese and Nichols, Inc., Fort Worth.

Casteel, R.W.
1977 Characterization of Faunal Assemblages and the Minimum Number of Individuals Determined from Paired Elements: Continuing Problems in Archaeology. J. of Archaeological Science 4:125-134.

Cerling, T.E.
1984 The stable isotopic composition of modern soil carbonate and its relationship to climate. Earth and Planetary Science Letters (71): 229-240.

Chaplin, R.E.
1971 The Study of Animal Bones from Archaeological Sites. Seminar Press, New York.

Chapman, C.H.
1975 The Archaeology of Missouri, I. University of Missouri Press, Columbia.

Cheatum, E.A.
1974 Molluscan fauna of the Gore Pit Site in Comanche County, Oklahoma: Plains Anthropologist 19: 32-45.

Cheatum, E.A. and D.C. Allen
1963 An Ecological Comparison of the Ben Franklin and Clear Creek Local Molluscan Faunas in Texas. Journal of the Graduate Research Center 31(3):174-179.

Cleland, C.E.
1966 The Prehistoric Animal Ecology and Ethnozoology of the Upper Great Lakes Region. Anthropology Papers No. 29, Museum of Anthropology, University of Michigan, Ann Arbor.

Cliff, M.B. and R.W. Moir
1985 Cultural Resource Survey at Wynnwood Park, Lewisville Lake, Denton County, Texas. Archaeology Research Program, Southern Methodist University, Dallas. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

Conger, R.N.
1940 An Intermediate Site in Grayson County. The Record 1(7):28-29.

Crabtree, D.E.
1973 The Obtuse Angle as a Functional Edge. Tebiwa 16(1):46-53.

Creel, D.C., R.F. Scott IV and M.B. Collins
1990 A Faunal Record from West Central Texas and Its Bearing on Late Holocene Bison Population Changes in the Southern Plains. Plains Anthropologist 35 (127): 55-69.

Crook, W.W., Jr. and R.K. Harris
1952 Trinity Aspect of the Archaic Horizon: The Carrollton and Elam Foci. Bulletin of the Texas Archeological and Paleontological Society 23:7-38.

1953 Some recent finds at the Wheeler Site near Carrollton. The Record 11(5):21.

1954a Traits of the Trinity Aspect Archaic: Carrollton and Elam Foci. The Record 12(1):2-16.

1954b Another Distinctive Artifact: The Carrollton Axe. The Record 13(2):10-18.

1957 Hearths and Artifacts of Early Man Near Lewisville, Texas and Associated Faunal Material. Bulletin of the Texas Archeological Society 28:7-97.

1962 Significance of a New Radiocarbon Date From the Lewisville Site. Bulletin of the Texas Archeological Society 32(for 1961):327-330.

Cushing, F.H.
1896 Exploration of Ancient Key Dwellers' Remains on the Gulf Coast of Florida. Proceedings of the American Philosophical Society 35:329-432.

Davis, W.B.
1974 The Mammals of Texas. TPWD Bulletin 41, Texas Parks and Wildlife Dept., Austin.

Dice, L.R.
1943 The Biotic Provinces of North America. University of Michigan Press, Ann Arbor.

Dillehay, T.D.
1974 Late Quaternary Bison Population Changes on the Southern Plains. Plains Anthropologist 19(65):180-196.

Dyksterhuis, E.J.
1946 The Vegetation of the Fort Worth Prairie. Ecologica Monographs 16:1-29.

1948 The Vegetation of the Western Cross Timbers. Ecological Monographs 18:325-376.

Espinosa, Fray Isidro Felis De
1927 Descriptions of the Tejas or Asinai Indians, 1691-1722. Translated by M.A. Hatcher, 1927, Southwestern Historical Quarterly 31:2(:150-180).

Evans, O.F.
1958 The Frisco Flint Quarries. Bulletin of the Oklahoma Anthropological Society 6:33-34.

Fenneman, N.M.
1931 Physiography of Western United States. McGraw-Hill Book Company, Inc., New York.

1938 Physiography of Eastern United States. McGraw-Hill Book Co., Inc., New York.

Ferring, C.R.
1986a Rates of Fluvial Sedimentation: Implications for Archaeological Variability. Geoarchaeology 1(3):259-274.

1986b Late Holocene cultural ecology in the Southern Plains: perspectives from Delaware Canyon, Oklahoma. Plains Anthropologist. 31 (114, pt. 2): 55-82.

1986c Late Quaternary Geology and Environments of the Upper Trinity Basin. In An Assessment of the Cultural Resources in the Trinity Basin, Dallas, Tarrant and Denton Counties, Texas, edited by B. C. Yates and C. R. Ferring, p. 32-112. Institute of Applied Sciences, North Texas State University, Denton.

1987 Geoarchaeology of Site 41CO141, A Late Holocene Locality in the Upper Trinity Basin, Cooke County, Texas. In Test Excavations at 41CO141, Ray Roberts Reservoir, Cooke County, Texas, edited by D.J. Prikryl and B.C. Yates, p. 19-52. Contributions in Archaeology 4. Institute of Applied Sciences, North Texas State University, Denton.

1988a Geoarchaeological Investigations along Portions of Village Creek, Tarrant County, Texas. In Archaeological Investigation of the Proposed Green Oaks Boulevard Extension from IH30 to Fielder Road, Tarrant County, Texas, by S. L. Andrews and S. C. Caran, p. 10-19. Freese and Nichols, Inc., Fort Worth.

1988b Geologic Controls on Regional Patterns in late Holocene Archaeological Records from the Southern Plains. Geological Society of America Abstracts with Programs 20(7):136.

1988c Ceramic petrography of selected sherds. In, Peter, D.E. and D.E. McGregor (editors) Late Holocene Prehistory of the Mountain Creek Drainage. Appendectomy 6. Joe Pool Lake Archaeological Project, Vol. 1, Archaeology Research Program, Southern Methodist Univ., Dallas.

1989 The Aubrey Clovis Site: A Paleoindian Locality in the Upper Trinity River Basin, Texas. Current Research in the Pleistocene 6:9-11.

1990a Archaeological Geology of the Southern Plains. In Archaeological Geology of North America, edited by N.P. Lasca and J. Donahue, p. 253-266. Geological Society of America, Centennial Special Volume 4, Boulder, Colorado.

1990b Upper Trinity River Drainage Basin, Texas. In South Central Lowland-Ozark-Ouachita Area, Chap. 16, Quaternary Non-Glacial Geology: Conterminous United States, edited by R. Morrison. Denver, Geological Society of America, Decade of North American Geology, vol. K-2. (in press)

1990c The 1989 Investigations at the Aubrey Clovis Site, Texas. Current Research in the Pleistocene, 7: .

1992 Alluvial Soils and Geoarchaeological Research. In: Soils and Archaeology, edited by V.T. Holliday, Smithsonian Institution Press, Washington. p. 1-39.

1993 Late Quaternary Geology of the Upper Trinity River Basin, Texas. PhD Dissertation, University of Texas at Dallas.

1995a The Late Quaternary Geology and Archaeology of the Aubrey Clovis Site, Texas. In, Ancient Peoples and Landscapes (E. Johnson, editor), p. 273-281. Museum of Texas Tech University, Lubbock.

1995b Miiddle Holocene Environments, Geology and Archaeology in the Southern Plains. In, Archaeological Geology of the Archaic Period in North America (E.A. Bettis III, ed.). Special Paper No. 297. Geological Society of America, Boulder. p. 21-35.

Ferring, C.R. and S.A. Lebo
1988 Research Design for Archaeological and Historical Investigations at Lake Ray Roberts and Lake Lewisville, Texas. Institute of Applied Sciences, University of North Texas, Denton. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

Ferring, C.R and T.K. Perttula
1987 Defining the provenance of red slipped pottery from Texas and Oklahoma by petrographic methods. Journal of Archaeological Science 14: 437-456.

Ferring, C.R. and B. C. Yates
1997 Holocene Geoarchaeology and Prehistory of the Ray Roberts Lake Area, North Central Texas. Institute of Applied Sciences, University of North Texas, Denton.

Ford, A. and E. Pauls
1980 Soil Survey of Denton County, Texas. U.S. Department of Agriculture, Soil Conservation Service. U.S. Government Printing Office, Washington, D.C.

Frison, G.C.
1968 A Functional Analysis of Certain Chipped Stone Tools. American Antiquity 33(2):149-155.

Frison, G.C.
1978 Animal Population Studies and Cultural Inference. Plains Anthropologist 23(82):44-52.

Fullington, R. and K. Fullington
1982 Molluscan faunas from Delaware Canyon, in Ferring, C.R., ed., The Late Holocene prehistory of Delaware Canyon, Oklahoma: Denton, University of North Texas, Contributions in Archaeology 1, p. 95-116.

Gilbert, B.M.
1980 Mammalian Osteology. Revised from Mammalian Osteo-Archaeology: North America (Missouri Archaeological Society). B. Miles Gilbert, Publisher, Laramie.

Gilbert, B.M., L.D. Martin, and H.G. Savage
1981 Avian Osteology. B. Miles Gilbert, Publisher, Laramie.

Graham, R.W.
1987 Late Quaternary Mammalian Faunas and Paleoenvironments of the Southwestern Plains of the United States. In Late Quaternary Mammalian Biogeography and Environments of the Great Plains and Prairies, edited by R.W. Graham, H.A. Semken, Jr., and M.A. Graham, p. 24-86. Scientific Papers Vol. 22. Illinois State Museum, Springfield.

Graham, R.W. and J. I. Mead
1987 Environmental Fluctuations and Evolution of Mammalian Faunas during the Last Deglaciation in North America. In The Geology of North America, vol. K-3, North America and Adjacent Oceans during the Last Deglaciation, edited by W.F. Ruddiman and H.E. Wright, Jr., p. 371-402. Geological Society of America, Boulder.

Grayson, D.K.
1978 Reconstructing Mammalian Communities: A Discussion of Shotwell's Method of Paleoecological Analysis. Paleobiology 4:77-81.

1979 On the Quantification of Vertebrate Archaeofaunas. Advances in Archaeological Method and Theory 2:199-237.

Griffin, J.B.
1955 Observations on the Grooved Axe in North America. The Pennsylvania Archaeologist 25(1):32-44.

Haas, H., V. Holliday, and R. Stuckenrath
1986 Dating of Holocene Stratigraphy with Soluble and Insoluble Organic Fractions at the Lubbock Lake Archaeological Site, Texas: An Ideal Case Study. Radiocarbon 28(2A): 473-485.

Hall, S.A.
1988 Environment and Archaeology of the Central Osage Plains: Plains Anthropologist 33 (120): 203-218.

1990 Channel Trenching and Climatic Change in the Southern U.S. Great Plains. Geology 18: 342-345.

1992 Late Quaternary Vegetation and Climate of the Northwest Gulf Coastal Plain: Geological Society of America, Abstracts with Programs 23 (1): 13.

Harris, R.K.
1936 Indian Campsites of the Upper Trinity River Drainage. Bulletin of the Texas Archeological and Paleontological Society 8:113-133.

1939 A Survey of Three Denton County Indian Village Sites. The Record 1(2):6-8.

1940 Two Indian Village Sites Near the City of Denton. The Record 2(1):5-6.

1949c The Jordan Farm Site. The Record 8(1):2-4.

1950 Preliminary Report on Site 18C7-10. The Record 8(5):21-22.

1951a A Plainview Point From Site 18C7-3, Denton County, Texas. The Record 10(1):2.

1951b A Preliminary Report on Site 18C4-6 in Denton County, Texas. The Record 9(4):18-20.

Harris, R.K. and I. M. Harris
1970 A Bison Kill on Dixon's Branch, Site 27A2-5, Dallas County, Texas. The Record 27 (1): 1-2.

Harris, R.K. and R. Hatzenbuehler
1949 Refuse Pits Excavated in Site 27A1-2. The Record 7(5):17-19.

Haynes, C.V., Jr.
1991 Geoarchaeological and Paleohydrological Evidence for a Clovis-age Drought in North America and its Bearing on Extinction. Quaternary Research 35: 438-450.

Heizer, R.F.
1974 Some Thoughts on Hoaxes and Flakes. Bulletin of the Texas Archeological Society 45:191-196.

Heizer, R.F. and R.A. Brooks
1965 Lewisville: Ancient Campsite or Wood Rat Houses? Southwestern Journal of Anthropology 21:155-165.

Henderson, J.
1978a Faunal Analysis. In Archaeological Research at Proposed Cooper Lake, Northeast Texas, 1974-1975, edited by K. Doehner and R.E. Larson, pp. 99-114. Final report to Interagency Archeological Services Div., Office of Archeology and Historic Preservation, Heritage, Conservation and Recreation Service, Atlanta. Archaeology Research Program, Southern Methodist University, Dallas.

1978b Faunal Analyses. In Evaluation of the Archaeology at the Proposed Cooper Lake, edited by K. Doehner, D. Peter and S.A. Skinner, pp. 77-86, 108-115, 200-207. Archaeology Research Program Research Report 114, Southern Methodist Univ., Dallas.

Hendricks, L.
1976 Geology of the Midcities Area, Tarrant, Dallas, and Denton Counties, Texas. Geologic Quadrangle Map No. 42. Bureau of Economic Geology, University of Texas, Austin.

Henry, D.O.
1995 Cultural and Paleoenvironmental Successions Revealed by the Hog Creek Archaeological Investigation, Central Texas. In, Advances in Texas Archaeology, Contributions from Cultural Resources Management (J.E. Bruseth and T.K. Perttula, editors). pp. 51-80. Texas Historical Commission, Austin.

Hickerson, H.
1965 The Virginia Deer and Intertribal Buffer Zones in the Upper Mississippi Valley. In Man, Culture, and Animals: The Role of Animals in Human Ecological Adjustments. Edited by Anthony Leeds and A.P. Vayda, pp. 43-66. American Association for the Advancement of Science, No. 78. Washington, D.C.

Hill, R.T.
1901 Geography and Geology of the Black and Grand Prairies, Texas, With Detailed Description of the Cretaceous Formations and Special Reference to Artesian Waters. In Twenty-First Annual Report to the United States Geological Survey 1899-1900, Part 7, Texas.

Hillson, S.
1986 Teeth. Cambridge Univ. Press, Cambridge.

Hofman, J.
1984 Plains Villagers: The Custer Focus. in, Bell, R.E. (ed.), Prehistpory of Oklahoma, pp. 287-306. Academic Press, New York.

Holliday, V.T.
1985 Archaeological Geology of the Lubbock Lake Site, Southern High Plains of Texas. Geological Society of America Bulletin 96:1483-1492.

1990 Pedology in archaeology, in, Lasca, N.P. and Donahue, eds., Archaeological Geology of North America. Geological Society of America, Centennial Special Volume 4. Boulder. p. 525-540.

Holliday, V.T., and B. L. Allen
1987 Geology and Soils. In Lubbock Lake, Late Quaternary Studies on the Southern High Plains, edited by E. Johnson, p. 14-21. Texas A&M University Press, College Station.

Holloway, R.
1993 Pollen analysis of Ferndale Bog, Oklahoma. Report to the Institute of Applied Sciences, University of North Texas.

Holloway, R.G., L.M. Raab and R. Stuckenrath
1987 Pollen Analysis of Late Holocene Sediments from a Central Texas Bog. Texas Journal of Science 39: 71-79.

Holman, J.A.
1963 Late Pleistocene Amphibians and Reptiles of the Clear Creek and Ben Franklin Local Faunas of Texas. Journal of the Graduate Research Center 31(3):152-167.

House, K.D.
1978 Faunal Analysis in Texas Archeological Sites. In, Essays Honoring R. King Harris. Edited by K.D. House, pp. 93-131. Institute of the Study of Earth and Man, Reports of Investigations No. 3. Southern Methodist University, Dallas.

Hudson, C.
1976 The Southeastern Indians. The University of Tennessee Press.

Humphrey, J. and C.R. Ferring
1994 Stable Isotopic Evidence for Late Pleistocene to Holocene Climatic Change, North-Central Texas. Quaternary Research 41: 200-213.

Johnson, E.
1986 Late Pleistocene and Early Holocene Vertebrates and Paleoenvironments on the Southern High Plains. Geographie Physique et Quaternaire 40(3):249-261.

Johnson, E., ed.
1987 Lubbock Lake, Late Quaternary Studies on the Southern High Plains. Texas A&M University Press. College Station.

Johnson, E., and V. T. Holliday
1980 A Plainview kill/butchering locale on the Llano Estacado-the Lubbock Lake site: Plains Anthropologist 25: 89-111.

Johnson, A.E.
1974 Settlement Pattern Variability in Brush Creek Valley, Platte County, Missouri. Plains Anthropologist 19(64):107-122.

1976 A Model of the Kansas City Hopewell Subsistence-Settlement System. In Hopewellian Archaeology in the Lower Missouri Valley. Edited by A.E. Johnson, pp. 7-15. University of Kansas Publications in Anthropology No. 8. Lawrence.

1979 Kansas City Hopewell. In Hopewell Archaeology: The Chillicothe Conference. Edited by D.S. Brose and N'omi Greber, pp. 86-93. The Kent State University Press.

Krieger, A.D.
1946 Culture Complexes and Chronology in Northern Texas. University of Texas Publications No. 4640.

1956 Historic Survival of the Atlatl in the Lower Mississipp Region. Bulletin of the Texas Archeological Society 27:195-207.

Lawrence, B.
1951 Post-cranial Skeletal Characters of Deer, Pronghorn and Sheep-Goat with Notes on Bos and Bison, Part II. Papers of the Peabody Museum of American Archaeology and Ethnology 35(3):9-43.

Lebo, S.A. and K.L. Brown
1990 Archaeological Survey of the Lewisville Lake Shoreline, Denton County, Texas. Institute of Applied Sciences, University of North Texas. Report submitted to the Fort Worth District U.S. Army Corps of Engineers.

Lebo, S.A.
1996 Historic Archaeology of the Lewisville Lake Area. Institute of Applied Sciences, University of North Texas, Denton. Report submitted to the Fort Worth District U.S. Army Corps of Engineers.

1997a Historic Archaeology of the Ray Roberts Lake Area. Institute of Applied Sciences, University of North Texas, Denton. Report submitted to the Fort Worth District U.S. Army Corps of Engineers.

1997b Archaeology and History of the Jones (41CO150) and Johnson (41CO148) Homesteads, Ray Roberts Lake, Cooke County, Texas. Institute of Applied Sciences, University of North Texas, Denton. Report submitted to the Fort Worth District U.S. Army Corps of Engineers.

Lemley, H.J.
1942 Prehistoric Novaculite Quarries of Arkansas. Bulletin of the Texas Archeological and Paleontological Society 14:32-37.

Lintz, C.
1984 The Plains Villagers: Antelope Creek. In, Prehistory of Oklahoma (R.E. Bell, editor), pp. 325-346. Academic Press, New York.

Lopez, D.R. and R. Saunders
1973 Current Lithic Studies in Oklahoma. Oklahoma Anthropological Society Newsletter 21(9):1-4.

Lundelius, E.L., Jr.
1962 Nonhuman Skeletal Material from the Kyle Site. Appendix 2 in The Kyle Site: A Stratified Central Texas Aspect Site in Hill County, Texas. Edited by E.B. Jelks, pp. 111-112. Archeology Series No. 5. Department of Anthropology, University of Texas at Austin.

1967 Late Pleistocene and Holocene Faunal History of Central Texas. In Pleistocene Extinctions: TheSearch for a Cause. Edited by P.S. Martin, pp. 289-320. Yale University Press, New Haven.

Lyman, R.L.
1984 A Model of Large Freshwater Clam Exploitation in the Prehistoric Southern Columbia Plateau Culture Area. Northwest Anthropological Research News 18(1):97-107.

Lyman, R.L.
1985 Bone Frequencies: Differential Transport, in situ Destruction, and the MGUI. J. of Archaeological Science 12:221-236.

Lynott, M.J.
1975 Archaeological Excavations at Lake Lavon 1974. Archaeological Research Program, Contributions in Anthropology No. 16. Southern Methodist University, Dallas. Report submitted to the National Park Service, Southwest Region.

1977 A Regional Model for Archaeological Research in Northcentral Texas. Unpublished Ph.D. Dissertation. Southern Methodist University, Dallas.

1978 Radiocarbon Dating the Wylie Focus in Northcentral Texas. Plains Anthropologist 22(77): 233-237.

1979 Prehistoric Bison Populations of Northcentral Texas. Bulletin of the Texas Archeological Society 50:89-1-1.

1981 A Model of Prehistoric Adaptation in Northern Texas. Plains Anthropologist 26(92):97-110.

Lynott, M.J. and P.A. Murry
1978 An Archaeological Assessment of Bear Creek Shelter, Lake Whitney, Texas. Archaeology Research Program, Southern Methodist University, Dallas.

Maria, Fray Francisco Casanas De Jesus
1927 Descriptions of the Tejas or Asinai Indians, 1691-1722. Translated by M.A. Hatcher, 1927, Southwestern Historical Quarterly 30(3):206-218.

Marmaduke, W.S.
1975 The Wylie Focus: A reassessment by the analysis of three typical sites. Unpublished Master's thesis, University of Texas at Austin.

Martin, W.A.
1988 Exploitation of Subsistence Resources within the Mountain Creek Drainage. In Late Holocene Prehistory of the Mountain Creek Drainage, edited by D.E. Peter and D.E. McGregor, Chap. 15. Joe Pool Lake Archaeological Project, Vol. 1, Archaeology Research Program, Southern Methodist Univ., Dallas.

1995 Prehistoric Subsistence Strategies in North-Central Texas: Evidence from Joe Pool Lake and Richland Chambers Reservoir, In, Advances in Texas Archaeology, Contributions from Cultural Resources Management (J.E. Bruseth and T.K. Perttula, editors). pp. 203-246. Texas Historical Commission, Austin.

Martin, W.A. and J.E. Bruseth
1988 Wylie Focus pits: A new look at some old features. The Record 42 (3): 20-35.

Maxwell, M.
1951 Woodland Cultures of Southern Illinois. Logan Museum Publications in Anthropology, Bulletin 7. Beloit.

McCormick, O.F.
1976 An Archeological Reconnaissance of Fivemile Creek Floodplain, Dallas County, Texas. Institute of Applied Sciences, North Texas State University, Denton.

McCormick, O.F., R.E. Filson, and J.L. Darden
1975 The Xerox-Lewisville Archaeological Project. Institute of Applied Sciences, North Texas StateUniversity, Denton.

McDonald, J.N.
1981 North American bison, their classification and evolution: Berkeley, University of California Press.

McGregor, D.E.
1995 Lithic resource Availability in the Upper Trinity River Region: The Evidence from Joe Pool Lake In, Advances in Texas Archaeology, Contributions from Cultural Resources Management (J.E. Bruseth and T.K. Perttula, editors). pp. 187-202. Texas Historical Commission, Austin.

McGregor, D.E. and J.E. Bruseth
1987 Hunter-Gatherer Adaptations Along the Prairie Margin. Richland Creek Technical Series, Vol. III. Archaeology Research Program, Southern Methodist University, Dallas.

Meltzer, D.J.
1987 The Clovis Paleoindian Occupation of Texas: Results of the Texas Clovis Fluted Point survey: Bulletin of the Texas Archeological Society 57: 27-68.

1991 Altithermal archaeology and paleoecology at Mustang Springs, on the Southern High Plains of Texas: American Antiquity 56(2):236-267.

Miller, P.A.
1979 An Archaic Tool Tradition in the Plains: A Case Study of the Coffey Site. Unpublished M.A. Thesis, University of Kansas, Lawrence.

Morris, V., and B. Morris
1970 The excavations of bison remains in northwest Dallas County. The Record 27(1): 2-5.

Munzel, S.
1986 Quantitative Analysis and the Reconstruction of Site Patterning. Paper presented at the Vth International Conference of the International Council for ArchaeoZoology, Aug. 25-30, Bordeaux.

Murry, P.
1982 Prehistoric Faunal Ecology of the Lakeview Project: Phase Two. In Archaeological Investigations at Lakeview Lake: 1979 and 1980), edited by L.M. Raab, pp. 247-255. ARP Archaeological Monographs No. 2, Southern Methodist Univ., Dallas.

1987 Analysis of Faunal Remains: Bird Point Island Site. In The Bird Point Island and Adams Ranch Sites: Methodological and Theoretical Contributions to NorthCentral Texas Archaeology, edited by J.E. Bruseth and W.A. Martin, pp. 136-140. Richland Creek Technical Series, Vol. II, Archaeology Research Program, Southern Methodist Univ., Dallas.

Neck, R. W.
1987 Changing Holocene Snail Faunas and Environments along the Eastern Caprock Escarpment of Texas. Quaternary Research 27:312-322.

Newcomb, W.W., Jr.
1986 The Indians of Texas. University of Texas Press, Austin.

Nissen, K. and M. Dittemore
1974 Ethnographic Data and Wear Pattern Analysis: A Study of Socketed Eskimo Scrapers. Tebiwa 17:67-88.

Nunez Cabeza de Vaca, Alvar
1907 The Narratives of Alvar Nunez Cabeza de Vaca. In Original Narratives of Early American History, Spanish Explorers in the Southern U.S., 1528-1543. Translated by F.W. Hodge, Charles Scribner's Sons, New York.

Nunley, P.
1973 An Assessment of Archeological Resources in the Vicinity of Garza-Little Elm Reservoir. RichlandArcheological Society, Miscellaneous Papers No. 1, Richland College.

O'Brien, P.J.
1977 Cultural Resources Survey of Smithville Lake, Missouri, Volume 1: Archaeology. Report submitted to the U.S. Army Corps of Engineers, Kansas City District.

Odell, G.H.
1977 The Application of Micro-Wear Analaysis to the Lithic Component of an Entire Prehistoric Settlement: Methods, Problems, and Functional Reconstructions. Unpublished Ph.D. Dissertation, Department of Anthropology, Harvard University, Boston.

Odum, E.P.
1971 Fundamentals of Ecology, 3rd Edition. W.B. Saunders Co., Philadelphia.

Olsen, S.J.
1960 Post-cranial Skeletal Characters of Bison and Bos. Papers of the Peabody Museum of Archaeology and Ethnology 35(4):1-64.

1961 The Relative Value of Fragmentary Mammalian Remains. American Antiquity 26:538-540.

1964 Mammal Remains from Archaeological Sites, Part I: Southeastern and Southwestern US. Papers of the Peabody Museum of ARchaeology and Ethnology 56(1):1-162.

1968 Fish, Amphibian and Reptile Remains from Archaeological Sites, Part I: Southeastern and Southwestern US. Papers of the Peabody Museum of Archaeology and Ethnology 56(2):1-104.

Perino, G.
1968 Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society Special Bulletin No. 3. Oklahoma City.

1971 Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society Special Bulletin No. 4. Oklahoma City.

Perkins, D., Jr., and P. Daly
1968 A Hunters' Village in Neolithic Turkey. Scientific American 219(5):97-106.

Perttula, T.K.
1984 Patterns of Prehistoric Lithic Raw Material Utilization in the Caddoan Area: The Western Gulf Coastal Plain. In Prehistoric Chert Exploitation: Studies From the Midcontinent. Edited by B.M. Butler and E.E. May, pp. 129-148. Southern Illinois University at Carbondale, Center for Archaeological Investigations, Occasional Paper No. 2.

Peter, D.E. and D.E. McGregor (assemblers)
1987 Cobb Pool Site, 41DL148. In Late Holocene Prehistory of the Mountain Creek Basin. pp. 9.1-9.24. Archaeology Research Program, Southern Methodist University, Dallas. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

Peter, D.E. and D.E. McGregor
1988 Late Holocene Prehistory of the Mountain Creek Drainage. Joe Pool Lake Archaeological Project, Vol. 1, Archaeology Research Program, Southern Methodist Univ., Dallas.

Prewitt, E.R.
1981 Cultural Chronology in Central Texas. Bulletin of the Texas Archeological Society 52:65-89.

Prikryl, D.J.
1987 A Synthesis of Prehistory of the Lower Elm Fork of the Trinity River. Unpublished M.A. Thesis, The University of Texas at Austin.

Prikryl D.J. and B.C. Yates (editors)
1987 Test Excavations at 41CO141, Ray Roberts Reservoir, Cooke County, Texas. Institute of Applied Sciences, North Texas State University, Denton. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

Quade, J.,T.E. Cerling, and J.R. Bowman
1989 Systematic variations in carbon and oxygen isotopic composition of pedogenic carbonate along elevation transects in the southern Great Basin, United States: Geological Society of America Bulletin (101):464-475.

Raab, M.
1982 Archaeological Investigations at Lakeview Lake: 1979 and 1980. ARP Archaeological Monographs No. 2. Archaeology Research Program, Southern Methodist Univ., Dallas.

Raab, L.M., J.E. Bruseth, A.J. McIntyre, C.R. Ferring, and N. Reese
1980 Archaeological Testing at Lakeview Lake, 1979. Human Use of the Land. Archaeology Research Program, Southern Methodist University, Dallas.

Raab, L.M. (assembler), A.J. McIntyre, J.E. Bruseth, D.E., McGregor, C.R. Ferring, and N.G. Reese
1982 Archaeological Investigations at Lakeview Lake: 1979 and 1980. Archaeology Research Program, Southern Methodist University, Archaeological Monographs No. 2. Dallas.

Read, L.B.
1954 The Pelecypoda of Dallas County, Texas. Field and Laboratory 22(2):35-52.

Reeves, B.
1973 The Concept of the Altithermal Cultural Hiatus in Northern Plains Prehistory. American Anthropologist 75(5):1221-1253.

Reid, K.C.
1980 Nebo Hill: Archaic Political Economy in the Riverine Midwest. Unpublished Ph.D. Dissertation. University of Kansas Department of Anthropology, Lawrence.

1984 Nebo Hill and Late Archaic Prehistory on the Southern Prairie Peninsula. University of Kansas Publications in Anthropology No. 15. Lawrence.

Ross, R.E.
1966 The Upper Rockwall and Glen Hill Sites, Forney Reservoir. Texas Archeological Salvage ProjectNo. 9, The University of Texas at Austin.

Saunders, R.S.
1974 Survey of Oklahoma's Lithic Resources. Oklahoma Anthropological Society Newsletter 22(6):5-9.

Schambach, F.
1982 An Outline of Fourche Maline Culture in Southwest Arkansas. in, N. Trubowitz and M.D. Jeter, eds., Arkansas Archaeology in Review, pp. 132-197. Arkansas Archaeological Survey, Fayetteville.

Schiffer, M.B.
1976 Behavioral Archeology. Academic Press, New York.

1983 Toward the Identification of Formation Processes. American Antiquity 48(4):675-706.

Schiley, R., R. Hughes, C. Hinckley, R. Cahill, K. Konopka, G. Smith, and M. Saporoschenko
1985 The Moessbauer Analysis of the Lewisville, Texas Archeological Site Lignite and Hearth Samples. In, Environmental Geology Notes No. 109. Illinois Department of Energy and Natural Resources, State Geological Survey Division.

Schmidly, D.J.
1983 Texas Mammals East of the Balcones Fault Zone. Texas A&M Press, College Station.

Shuler, E.W.
1918 The Geology of Dallas County. University of Texas Bulletin, No. 1818, Austin.

1935 Terraces of the Trinity River, Dallas County, Texas. Field and Laboratory 3:44-53.

Semenov, S.A.
1964 Prehistoric Technology. Barnes and Noble, Great Britain.

Shaffer, B.S., and B.W. Baker
1992 A Vertebrate Faunal Analysis Coding System with North American Taxonomy and dBase Support Programs and Procedures. Technical Report 23. Museum of Anthropology, University of Michigan, Ann Arbor.

Shippee, J.M.
1948 Nebo Hill, A Lithic Complex in Western Missouri. American Antiquity 14(1): 29-32.

1957 The Diagnostic Point Type of the Nebo Hill Complex. The Missouri Archaeologist 19(3):42-46.

1964 Archaeological Remains in the Area of Kansas City: Paleo-Indians and the Archaic Period. Missouri Archaeological Society Research Series, No. 2.

Siegel, P.E.
1985 Edge Angle As A Functional Indicator: A Test. Lithic Technology 14(2):90-94.

Skinner, S.A.
1982 Archaeology and History of Lake Ray Roberts, Vol. 2, Construction Area Testing. Environmental Consultants, Inc., Dallas. Submitted to US Army Corps of Engineers, Ft. Worth.

Skinner, S.A. and L. Baird (assemblers)
1985 The Archaeology and History of Lake Ray Roberts, Vol. 3: Settlement in a Marginal Zone. AR Consultants, Dallas. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

Skinner, S.A., M.B. Cliff, L. Baird, A.B. Amerson, Jr., J. Bennett, A.R. Faust, J. Kaskey, K. Ludden, M.D. Northern, A. Pitchford, J. Raley, D.G. Shaddox, and D. Shanabrook
1982a The Archaeology and History of Lake Ray Roberts, Vol.1: Cultural Resources Survey. Environmental Consultants, Inc., Dallas. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

Skinner, S.A., M.B. Cliff, L. Baird, J. Garber, V. Scarborough, K. Singleton, A. Pritchford, J. Renner, K. Fimple, K. Hahn, and D.G. Shaddox

1982b The Archaeology and History of Lake Ray Roberts, Vol. 2: Construction Area Testing. Environmental Consultants, Inc., Dallas. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

Slaughter, B.H.

1965 Preliminary Report on the Paleontology of the Livingston Reservoir Basin, Texas. Fondren Science Series No. 10. Southern Methodist University, Dallas.

1966 The Moore Pit Local Fauna: Pleistocene of Texas. Journal of Paleontology 40(1):78-91.

Slaughter, B.H., W. W. Crook Jr., R.K. Harris, D.C. Allen, and M. Seifert

1962 The Hill-Shuler Local Faunas of the Upper Trinity River, Dallas and Denton Counties, Texas. Report of Investigations No. 48. Bureau of Economic Geology, University of Texas, Austin.

Slaughter, B.H. and R. Ritchie

1963 Pleistocene Mammals of the Clear Creek Local Fauna, Denton County, Texas. Journal of the Graduate Research Center 31(3):117-131.

Slaughter, B.H. and B.R. Hoover

1963 Sulphur River Formation and the Pleistocene Mammals of the Ben Franklin Local Fauna. Journal of the Graduate Research Center 31(3):132-148.

Slaughter, B.H. and R. Ritchie

1963 Pleistocene Mammals of the Clear Creek Local Fauna. Denton County, Texas. Journal of the Graduate Research Center 31(3):117-131.

Stanford, D.

1982 A Critical Review of Archeological Evidence Relating to the Antiquity of Human Occupation of the New World. In, Plains Indians Studies, A Collection of Essays in Honor of John C. Ewers and Waldo Wedel. Edited by D.H. Ubelaker and H.J. Viola, pp. 208-218. Smithsonian Contributions to Anthropology No. 30. Smithsonian Institution Press, Washington, D.C.

Stenlund, M.H.

1956 How to Produce Deer. Conservation Volunteer 19: 33-36.

Stephenson, R.L.

1948a Archaeological Survey of Grapevine Reservoir, Tarrant and Denton Counties, Texas. River Basin Surveys, Smithsonian Institution. MS. on file, Texas Archeological Research Laboratory, Austin.

1948b Unpublished site survey forms, notes, and artifact lists on file at the Texas Archeological Research Laboratory, Austin.

1949 Archaeological Survey of Lavon and Garza-Little Elm Reservoirs: A Preliminary Report. Bulletin of the Texas Archeological and Paleontological Society 20:21-62.

1950 Archaeological Survey of Garza-Little Elm Reservoir. River Basin Surveys, Smithsonian Institution. MS on file, Texas Archeological Research Laboratory, Austin.

1952 The Hogge Bridge Site and the Wylie Focus. American Antiquity 17: 299-312.

Story, D.A.
1990a Environmental Setting. In The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume I. By D.A. Story, J.A. Guy, B.A. Burnett, M.D. Freeman, J.C. Rose, D.G. Steele, B.W. Olive, and K.J. Reinhard pp. 5-26. Arkansas Archeological Survey Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

1990b Culture History of the Native Americans. In, The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume I. By D.A. Story, J.A. Guy, B.A. Burnett, M.D. Freeman, J.C. Rose, D.G. Steele, B.W. Olive, and K.J. Reinhard pp. 163-366. Arkansas Archeological Survey Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

Stovall, J.W. and W. N. McAnulty
1950 The Vertebrate Fauna and Geologic Age of the Trinity River Terraces in Henderson County, Texas. American Midland Naturalist 44(1):211-250.

Stuiver, M. and B. Becker
1987 Radiocarbon Calibration Program 1987. University of Washington, Quaternary Isotope Lab.

Styles, B.W., and J.R. Purdue
1984 Faunal Exploitation at the Cedar Grove Site. In Cedar Grove: An Interdisciplinary Investigation of a Late Caddo Farmstead in the Red River Valley, edited by N. Trubowitz, pp. 211-226. AAS Research Series No. 23, Arkansas Archaeological Survey, Fayetteville.

Suhm, D.A. and E.B. Jelks
1962 Handbook of Texas Archeology: Type Descriptions. The Texas Archeological Society and the Texas Memorial Museum, Austin.

Swanton, J.R.
1939 Final Report of the United States DeSoto Expedition Commission. Smithsonian Institution Press, Washington, D.C.

1942 Source Material on the History and Ethnology of the Caddo Indians. Smithsonian Institution, Bureau of American Ethnology Bulletin 132, Washington, D.C.

1946 The Indians of the Southeastern United States. Smithsonian Institution, Bureau of American Ethnology Bulletin 137. Washington, D.C.

Taggart, J.N.
1953 Problems in Correlation of Terraces along the Trinity River in Dallas, County, Texas. Master's Thesis, Southern Methodist University, Dallas.

Texas Game, Fish and Oyster Commission
1945 Principal Game Birds and Mammals of Texas: Their Distribution and Management. Texas Game, Fish and Oyster Commission, Austin.

Thurmond, J.T.
1967 Quaternary Deposits of the East Fork of the Trinity River, North Central Texas. Master's Thesis, Southern Methodist University, Dallas.

Thurmond, J.P.
1981 Archaeology of the Cypress Creek Basin, Northeastern Texas and Northwestern Louisiana. PhD. Dissertation, University of Texas at Austin.

Turner, E.S. and T.R. Hester
1985 A Field Guide to Stone Artifacts of Texas Indians. Texas Monthly Press, Austin.

Urbanovsky, E. J.
1972 Planning Components of the Trinity River Basin of Texas: Ecology, History. Texas Tech University, Lubbock.

Watrall, C.R.
1968 Virginia Deer and the Buffer Zone in the Late Prehistoric-Early Protohistoric Periods in Minnesota. Plains Anthropologist 13(40):81-86.

Webb, W.L.
1950 Biogeographic Regions of Texas and Oklahoma. Ecology 31(3):426-434.

Wedel, W.R.
1961 Prehistoric Man on the Great Plains. University of Oklahoma Press, Norman.

Wendland, W.M.
1978 Holocene Man in North America: The Ecological Setting and Climatic Background. PlainsAnthropologist 23(82):273-287.

Wendland, W.M. and R.A. Bryson
1974 Dating Climatic Episodes of the Holocene. Quaternary Research 4:9-24.

White, T.E.
1952 Summary Report of the Paleontological Resources of the Texas Region. River Basin Surveys,Smithsonian Institution. MS. on file, Midwest Archaeological Research Center, Lincoln.

Willimon, E.L.
1972 New Local Faunas and Paleoecology (Pleistocene) of North Central Texas. Texas Journal of Science 23(4):449-469.

Wilson, L.R.
1966 Palynology of the Domebo site, in Leonhardy, F.C., ed., Domebo, a Paleo-indian mammoth kill in the prairie-plains, Lawton: Museum of the Great Plains, p. 44-50.

Winkler, A.J.
1990 Small mammals from a Holocene sequence in central Texas and their paleoenvironmental implications. Southwestern Naturalist 35(2):199-205.

Winton, W.M.
1925 The Geology of Denton County. University of Texas Bulletin No. 2544, Austin.

Wilmsen, E.N.
1968 Functional Analysis of Flaked Stone Artifacts. American Antiquity 33(2):156-161.

1970 Lithic Analysis and Cultural Inference: A Paleo-Indian Case. Anthropological Papers of the University of Arizona, No. 16, Tucson.

Wood. W.R. and D.L. Johnson
1978 A Survey of Disturbance Processes in Archaeological Site Formation. In Advances in Archaeological Method Theory 1. Edited by M.B. Schiffer pp. 315-383. Academic Press, New York.

Yates, B.C.
1984 Descriptive Inventory of Human Skeletal Remains, Hackberry Site, Lake Lewisville. The Record 40(1):8-9.

1985 Observations on the Faunal Remains from Archaeological Sites in the Proposed Joe Pool Reservoir, Dallas County, Texas. Report to Principal Investigators, Archaeology Research Program, Southern Methodist Univ., Dallas.

1988 Observations on the Vertebrate Faunal Remains from the 1987 Archaeological Season at Cooper Lake and Bone Tool Evaluation. Reports submitted to Archaeology Research Program, Southern Methodist Univ., Dallas.

1987 Zooarchaeological Investigations at 41CO141. In Test Excavations at 41CO141, Ray Roberts Reservoir, Cooke County, Texas. Institute of Applied Sciences, University of North Texas, Denton.

Yates, B.C., M.E. Brown and L. Schneibs
1989 Comparison of Bison Remains at Two Late Prehistoric Sites in Northcentral Texas. Paper presented at Texas Symposium, 1988 Plains Conference, Denton.

Yates, B.C. and C.R. Ferring (editors)
1986 An Assessment of the Cultural Resources in the Trinity Basin, Dallas, Tarrant, and Denton Counties, Texas. Institute of Applied Sciences, North Texas State University, Denton. Report submitted to the U.S. Army Corps of Engineers, Fort Worth District.

APPENDIX A: ARTIFACT DATA

Table A20.1 Artifacts from Test Pits at 41DN20

UNIT: level	9 E 44 S 35	10 E 47 S 35	11 E 50 S 35	12 E 53 S 35	13 E 63 S 35	7 E 51 S 71	8 E 51 S 105	16 E 51 S 118	15 E 51 S 131
14	1d	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-
19	2c	-	-	-	-	-	-	-	-
20	1d	-	-	-	-	-	-	-	-
21	-	1c	-	-	-	-	-	-	-
22	4c	1d	-	-	-	-	-	-	-
23	-	-	1t	-	-	-	-	1t	-
24	-	1d	-	-	-	-	-	-	-
25	-	-	-	1d	-	-	-	-	-
26	-	1t,1c	-	-	-	-	-	-	1t
27	-	-	-	-	-	-	-	-	-
28	-	1d	-	-	-	-	-	-	-
29	-	-	2t,1c	-	-	-	-	-	-
30	-	-	1t	1t,1c	-	-	-	-	-
31	-	-	-	1t	1d	-	-	-	-
32	-	-	-	1t	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-
35	-	-	-	-	2t	-	-	-	-

*d=dart/spear points
a=arrowpoints
t=tools
c=cores

Table A20.2 Debitage from Test Pits, 41DN20

UNIT: level	9 E 44 S 35	10 E 47 S 35	11 E 50 S 35	12 E 53 S 35	13 E 63 S 35	7 E 51 S 71	8 E 51 S 105	16 E 51 S 118	15 E 51 S 131
12	8	-	-	-	-	-	-	-	-
13	23	-	-	-	-	-	-	-	-
14	38	-	-	-	-	15	-	-	-
15	19	4	-	-	-	-	-	-	-
16	35	18	-	-	-	11	6	-	-
17	28	6	-	-	-	-	12	-	-
18	52	34	-	-	-	9	8	-	-
19	32	40	15	-	-	-	9	-	-
20	24	32	29	-	-	-	20	17	-
21	23	33	33	-	-	-	14	21	-
22	36	30	30	63	-	-	18	7	-
23	28	32	29	41	-	-	37	14	-
24	-	36	20	35	-	-	16	11	3
25	-	76	43	45	-	-	22	13	7
26	-	102	49	39	-	-	18	21	11
27	-	43	40	42	-	-	-	19	19
28	-	17	53	49	-	-	-	14	11
29	-	-	77	33	-	-	-	11	14
30	-	-	71	49	9	-	-	14	13
31	-	-	23	31	33	-	-	44	15
32	-	-	-	24	60	-	-	-	21
33	-	-	-	-	44	-	-	-	15
34	-	-	-	-	26	-	-	14	18
35	-	-	-	-	47	-	-	-	15
36	-	-	-	-	57	-	-	-	4
37	-	-	-	-	28	-	-	-	9
total	346	503	512	451	304	35	180	255	175

Table A20.3 Fire Cracked Rock (gm) from Test Pits at 41DN20

UNIT:	9	10	11	12	13	7	8	16	15
	E 44	E 47	E 50	E 53	E 63	E 51	E 51	E 51	E 51
level	S 35	S 35	S 35	S 35	S 35	S 71	S 105	S 118	S 131
17	2	-	-	-	-	-	-	-	-
18	21	1	-	-	-	-	-	-	-
19	8	5	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-
21	23	-	2	-	-	-	-	-	-
22	28	19	-	-	-	-	-	-	-
23	21	30	-	-	-	-	-	-	-
24	-	5	189	3	-	-	-	-	-
25	-	11	90	3	-	-	-	-	-
26	-	346	55	33	-	-	-	-	-
27	-	5	-	17	-	-	-	-	-
28	-	29	251	9	-	-	-	-	-
29	-	-	64	43	-	-	-	-	-
30	-	-	74	124	-	-	-	-	6
31	-	-	74	45	-	-	-	-	2
32	-	-	-	35	1	-	-	-	-
33	-	-	-	-	-	-	-	-	8
34	-	-	-	-	4	-	-	-	8
35	-	-	-	-	11	-	-	-	-
total	103	451	799	312	16	0	0	0	24

Table A27.1 Projectile Points from Test Pits, 41DN27

TYPE	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 7
ARROW				
Huffaker			-/1	
Fresno			-/1	
Unid		1/-		
DART				
Gary				-/1
Elam			-/1	
Unid	-/1	1/1		
Total	1	3	3	1

/ = chert/quartzite

Table A27.2 Debitage from Test Pits, 41DN27

LEVEL	S56/E43	S73/E21
1	-	120
2	5	77
3	40	63
4	54	12
5	57	13
6	34	11
7	29	1
8	17	-
9	3	-
10	0	-
11	4	-
Total	243	297

Table A27.3 Dart Points from Block 3, 41DN27

TYPE	LEVEL 18	19	21	22
Gary	1			
Wells		1		
Yarborough			1	
Kent				1
Unid			1	1

Table A27.4 Artifacts from 41DN27, Block 3

CLASS/Type	LEVEL 16	17	18	19	20	21	22	23	Total
TOOLS									
retouch		2	2		3	3	1	5	16
notch					1		1		2
knife						1			1
Dart Pt.			1	1		1	2	1	6
Unif. Mano			1						1
Hammerstone					1		1	1	3
Chunks	1	8	12	3	3	12	4	4	47
Core							1		1
Ceramics		3	2	3					8
TOTAL	1	13	18	7	8	17	10	11	85

Table A27.5 Debitage, 41DN27, Block 3

LEVEL	Quartzite %	Chert %	Interior %	n
16	66	34	70	38
17	69	31	82	124
18	72	28	81	238
19	77	23	73	160
20	80	20	71	152
21	79	21	78	187
22	79	21	73	123
23	78	22	73	100
Total				1122

Table A27.6 Shell and FCR, 41DN27, Block 3

LEVEL	Shell (gm)	FCR (kg)
16	0.1	0.00
17	0.4	0.08
18	0.0	0.04
19	6.7	0.17
20	0.7	38.48
21	0.0	28.09
22	0.1	0.47
23	0.0	0.04
Total	8.0	67.36

Table A372.1 Projectile Points from Test Pits, 41DN372, Block 1

Type	LEVEL 2	3	4	5	7	8	10
ARROW							
Colbert	1/-						
Unid						1/-	
DART							
Gary		1/-	1/-				-/1
Godley			-/1				
Elam			-/1			-/1	
Refugio					-/1		
Darl						-/1	
Yarborough							-/1
Unid	1/-			-/2			1/-
Total	2	1	3	2	1	3	3

/ = chert/quartzite

Table A372.2 Debitage and Artifacts from test Pits, 41DN372

UNIT	44 'S43/E70	41 'S31/E59	43 'S31/E60	42 'S31/E64
Level				
1	1	29	1	0
2	51	294 1a,1p	17 2p	1 1d
3	37	541	40	12 1d
4	14 1 d	317 1d	27	13 1d
5	12	185 1d	12 1d	5
6	13	259	24	3
7		161 1d	16	
8		165 2d	11 2a	
9		92	4	
10	2 d	3 1d	2	
11		32		
Total debitage	128	2078	154	35

d = dart point; a = arrow point; p = pottery

Table A372.3 Shell and FCR from Test Pits, 41DN372

UNIT	44 'S43/E70		41 'S31/E59		43 'S31/E60		42 'S31/E64	
l	FCR*	Sh**	FCR	Sh	FCR	Sh	FCR	Sh
1	0.01	0	95.26	1	0.02	0	0.49	0
2			72.87	2	0.35	25	0	0
3			0.68	1	0.63	0	0.03	0
4			0.35	2	0.15	0	0.11	0
5	0.38	0	0.36	2	0.03	0	0.19	0
6			0.57	1	0.05	0		0
7			0.13	0	1.47	0		
8			1.41	0	0.95	0		
9			0.49	0	0.19	0		
10			0.03	0				
11			0.41	0				
Total	0.39	0	172.56	9	3.84	25	0.82	0

* kg; ** gm

APPENDIX B: BONE DATA

Table B26.1 Identified Fauna from Features, 41DN26

Feature	Taxon	Number of Identified Elements
1	fish small	1
1	indet. fish	2
1	indet. turtle	20
1	indet. snake	2
1	cottontail	1
1	pocket gopher	2
1	cotton rat	1
1	indet. rodent	2
1	mammal small	1
1	mammal large	9
	Feature 1 Total Identified	41
2	box turtle	1
2	indet. turtle	1
2	mammal medium	1
	Feature 2 Total Identified	3
3	catfish	2
3	fish small	1
3	indet. fish	2
3	softshell turtle	1
3	indet. turtle	23
3	non-poisonous snake	3
3	water snake	1
3	indet. snake	8
3	pocket gopher	1
3	cotton rat	1
3	indet. rodent	3
3	deer/pronghorn	1
3	cow/bison/wapiti	3
3	mammal small	3
3	mammal medium	7
3	mammal large	4
	Feature 3 Total Identified	64
4	fish small	1
4	box turtle	1
4	indet. turtle	3
4	pocket gopher	1
4	cotton rat	1
4	vole	1
4	mammal small	1
4	mammal medium	3
	Feature 4 Total Identified	12
5	musk/mud turtle	1
5	softshell turtle	1
5	indet. turtle	4
5	cottontail	1
5	indet. rodent	1
5	mammal small	1
5	mammal medium	1
	Feature 5 Total Identified	10
6	catfish	9
6	drum	1
6	bass/sunfish	2
6	fish small	8
6	indet. fish	11
6	toad/frog	1
6	box turtle	3
6	indet. turtle	74
6	non-poisonous snake	1
6	indet. snake	5
6	cottontail	5
6	blk-t jack rabbit	1
6	pocket gopher	5
6	cotton rat	3
6	vole	1
6	indet. rodent	3
6	white-tailed deer	1
6	deer/pronghorn	2
6	cow/bison/wapiti	1
6	mammal small	5
6	mammal medium	15
6	mammal large	9
	Feature 6 Total Identified	166
7	indet. fish	1
7	indet. turtle	6
7	mammal medium	2
7	indet. rodent	2
7	bison	2
	Feature 7 Total Identified	13
8	catfish	2
8	fish small	1
8	slider turtle	1
8	box turtle	1
8	indet. turtle	38
8	indet. snake	2
8	bird small	1
8	cottontail	2
8	pocket gopher	2
8	cotton rat	1
8	vole	2
8	indet. rodent	1
8	white-tailed deer	10
8	deer/pronghorn	1
8	cow/bison/wapiti	1
8	mammal small	2
8	mammal medium	15
8	mammal large	2
	Feature 8 Total Identified	85
9	fish small	1
9	indet. fish	6
9	box turtle	1
9	indet. turtle	51
9	eastern mole	1
9	cottontail	2
9	squirrel	2
9	pocket gopher	3
9	cotton rat	2
9	vole	1
9	indet. rodent	5
9	white-tailed deer	4
9	deer/pronghorn	2
9	cow/bison/wapiti	1
9	mammal small	10
9	mammal medium	17
9	mammal large	8
	Feature 9 Total Identified	121

Table B27.1 Faunal Remains from Test Pits at 41DN27

level	ID	%	UNID	%	UNID UB*	%	UNID B	%
0	6	100	0	0	0	0	0	0
1	18	13	116	87	92	79	24	21
2	23	15	131	85	112	85	19	15
3	13	13	85	87	60	71	25	29
4	15	17	74	83	62	84	12	16
5	8	16	43	84	34	79	9	21
6	6	26	17	74	15	88	2	12
7	4	19	17	81	11	65	6	35
8	8	62	5	38	3	60	2	40
9	0	0	3	100	1	33	2	67
10	0	0	7	100	5	71	2	29
11	3	16	16	84	14	88	2	12
12	0	0	1	100	0	0	1	100
totals	104		539		316		199	

* UB- unburned B- burned

Table B27.2 Identified Fauna from Features, 41DN27

Feature	Taxon	Number of Identified Elements
2	drum	1
2	fish small	1
2	indet. turtle	1
2	cottontail	2
2	pocket gopher	1
2	indet. rodent	1
2	deer/pronghorn	2
2	bison	95
2	mammal medium	3
2	mammal large	3
	Feature 2 Total Identified	110
3	white-tailed deer	1
3	deer/pronghorn	1
3	mammal small	1
3	mammal medium	2
3	mammal large	2
	Feature 3 Total Identified	7
4	indet. fish	33
4	fish small	13
4	catfish	9
4	sunfish	1
4	box turtle	1
4	indet. turtle	9
4	indet. snake	1
4	non-poisonous snake	1
4	indet. lizard	1
4	duck or goose	2
4	prairie chicken	4
4	domestic chicken	2
4	bird medium	6
4	cottontail	32
4	squirrel	1
4	pocket gopher	1
4	indet. rodent	2
4	white-tailed deer	10
4	deer/pronghorn	1
4	mammal small	8
4	mammal medium	3
4	mammal large	5
	Feature 4 Total Identified	146

Table B27.2, cont.

7	fish small	1
7	indet. turtle	5
7	mammal medium	1
7	mammal large	2
	Feature 7 Total Identified	9
9	catfish	1
9	indet. fish	1
9	indet. turtle	2
9	vole	1
9	indet. rodent	1
9	mammal small	3
9	mammal medium	4
9	mammal large	3
	Feature 9 Total Identified	16
10	indet. fish	5
10	indet. turtle	42
10	cottontail	1
	Feature 10 Total Identified	48
11	fish large	3
11	fish small	2
11	indet. fish	10
11	musk/mud turtle	1
11	indet. turtle	6
11	indet. snake	1
11	prairie chicken	1
11	cottontail	6
11	pocket gopher	8
11	white-tailed deer	2
11	deer/pronghorn	1
11	mammal small	7
11	mammal medium	9
11	mammal large	4
	Feature 11 Total Identified	61
12	fish small	2
12	indet. fish	3
12	catfish	1
12	musk/mud turtle	1
12	indet. turtle	16
12	cottontail	7
12	squirrel	1
12	pocket gopher	6
12	cotton rat	11
12	vole	1
12	indet. rodent	9
12	white-tailed deer	10
12	bison	53
12	mammal small	19
12	mammal medium	19
12	mammal large	27
	Feature 12 Total Identified	186
14	mammal small	1
14	mammal medium	1
	Feature 14 Total Identified	2

Table B27.3 Faunal Remains from Block 3, 41DN27

level	ID	%	UNID	%	UNID UB*	%	UNID B	%
16	3	9	29	91	26	90	3	10
17	8	2	407	98	392	96	15	4
18	29	7	416	93	401	99	15	1
19	14	13	95	87	74	78	21	22
20	10	16	53	84	33	62	20	38
21	18	19	79	81	29	34	50	66
22	8	9	86	91	57	66	29	34
23	8	11	62	89	48	77	14	23
total	98		1,227		1,060		167	

* UB - unburned B- burned

Table B372.1 Identified Fauna from Features. 41DN372

Feature	Taxon	Number of Identified Elements
1	fish small	1
1	gar	2
1	catfish	2
1	indet. fish	18
1	toad/frog	3
1	bullfrog	1
1	box turtle	2
1	softshell turtle	1
1	indet. turtle	61
1	non-poisonous snake	11
1	indet. snake	12
1	cottontail	4
1	ground squirrel	1
1	pocket gopher	10
1	pocket mouse	2
1	cotton rat	7
1	vole	2
1	indet. rodent	3
1	white-tailed deer	1
1	deer/pronghorn	5
1	mammal small	23
1	mammal medium	9
1	mammal large	7
	Feature 1 Total Identified	188
2	catfish	1
2	fish small	2
2	indet. fish	3
2	toad/frog	1
2	softshell turtle	1
2	indet. turtle	26
2	indet. snake	2
2	non-poisonous snake	2
2	indet. lizard	1
2	blk-t jack rabbit	1
2	pocket gopher	1
2	mammal small	7
2	mammal medium	5
2	mammal large	3
	Feature 2 Total Identified	56
5	catfish	1
5	fish small	1
5	indet. fish	34
5	box turtle	15
5	softshell turtle	1
5	indet. turtle	173
5	indet. snake	2
5	water snake	1
5	glass lizard	1
5	cottontail	3
5	pocket gopher	2
5	pocket mouse	1
5	cotton rat	2
5	vole	4
5	white-tailed deer	2
5	deer/pronghorn	2
5	mammal small	22
5	mammal medium	11
5	mammal large	18
	Feature 5 Total Identified	296
6	gar	5
6	catfish	5
6	fish small	37
6	indet. fish	68
6	toad/frog	1
6	slider or map turtle	3
6	musk/mud turtle	4
6	box turtle	12
6	softshell turtle	5
6	indet. turtle	307
6	non-poisonous snake	3
6	indet. snake	24
6	indet. lizard	2
6	bird small	1
6	cottontail	8
6	blk-t jack rabbit	2
6	swamp or jack rabbit	1
6	pocket gopher	7
6	pocket mouse	5
6	cotton rat	1
6	vole	11
6	indet. rodent	12
6	dog/coyote	1
6	white-tailed deer	5
6	deer/pronghorn	1
6	mammal small	29
6	mammal medium	28
6	mammal large	50
	Feature 6 Total Identified	638
7	gar	3
7	catfish	6
7	drum	1
7	fish small	20
7	indet. fish	45
7	box turtle	4
7	softshell turtle	2
7	indet. turtle	221
7	non-poisonous snake	3
7	viper	1
7	water snake	1
7	indet. snake	9
7	perching bird	1
7	cottontail	7
7	pocket gopher	2
7	pocket mouse	1
7	vole	3
7	indet. rodent	10
7	white-tailed deer	2
7	deer/pronghorn	6
7	mammal small	20
7	mammal medium	25
7	mammal large	43
	Feature 7 Total Identified	436
8	indet. fish	14
8	toad/frog	1
8	box turtle	8
8	softshell turtle	2
8	indet. turtle	96
8	non-poisonous snake	2
8	water snake	2

8	indet. snake	4
8	indet. lizard	1
8	cottontail	3
8	vole	1
8	indet. rodent	5
8	white-tailed deer	1
8	deer/pronghorn	1
8	mammal small	1
8	mammal medium	1
8	mammal large	5
	Feature 8 Total Identified	148
9	catfish	2
9	fish small	3
9	indet. fish	45
9	musk/mud turtle	2
9	box turtle	570
9	softshell turtle	2
9	indet. turtle	221
9	indet. snake	7
9	non-poisonous snake	3
9	blk-t jack rabbit	1
9	pocket gopher	2
9	pocket mouse	1
9	cotton rat	2
9	vole	2
9	indet. rodent	7
9	white-tailed deer	1
9	deer/pronghorn	3
9	mammal small	5
9	mammal medium	9
9	mammal large	15
	Feature 9 Total Identified	903
10	indet. fish	1
	Feature 10 Total Identified	1
11	indet. turtle	23
11	swamp or jack rabbit	1
11	pocket gopher	1
11	deer/pronghorn	1
11	mammal small	2
11	mammal large	1
	Feature 11 Total Identified	29

Table B372.2 Faunal Remains from TPs, 41DN372

level	identified	%	unidentified	%	total
1	85	17	407	83	492
2	305	15	1,677	85	1,982
3	282	21	1,078	79	1,360
4	290	22	1,024	78	1,314
5	223	20	878	80	1,101
6	275	20	1,093	80	1,368
7	265	18	1,188	82	1,453
8	469	23	1,612	77	2,081
9	305	21	1,181	79	1,486
10	9	20	35	80	44
11	129	14	792	86	921
totals	2,637	19	10,965		13,602

Table B381.1 Faunal Remains Recovered from Features, 41DN381*

Feature	ID	Unidentified UB	B	(%B)	Total
2	4		1		5
3	44	124	81	(34%)	237
7	19	52	48	(16%)	300
9	43	217	154	(53%)	414
10	0	0	1		1
11	48	179	183	(45%)	410
12	11	27	35	(48%)	73
13	5	3	18	(69%)	26
14	11	45	45	(45%)	101
15	0	71	28	(28%)	99
16	3	7	27	(73%)	37
17	9	57	28	(30%)	94
18	0	34	0		34

*Values expressed are frequencies of identified specimens (ID), unburned (UB) and burned (B) fragments of the unidentified fraction, and the total bone counts for each feature that yielded faunal remains. The percentage of burned bone (%B) is expressed as a portion of the total count for each feature.

Table B381.2 Identified Fauna from Features, 41DN381*

Feature	Taxon	Number of Identified Elements
2	non-poisonous snake	1
2	deer	1
2	mammal small	1
2	mammal large	1
	Feature 2 Total Identified	4
3	poisonous snake	1
3	indet. turtle	23
3	cottontail	2
3	pocket gopher	3
3	eastern mole	1
3	indet. rodent	1
3	mammal small	3
3	mammal medium	7
3	mammal large	2
	Feature 3 Total Identified	43
7	indet. turtle	7
7	cottontail	1
7	pocket gopher	1
7	indet. rodent	1
7	white-tailed deer	1
7	mammal small	2
7	mammal medium	3
7	mammal large	3
	Feature 7 Total Identified	19
9	indet. fish	1
9	box turtle	1
9	indet. turtle	32
9	pocket gopher	1
9	cow/bison/wapiti	1
9	white-tailed deer	1
9	deer/pronghorn	1
9	mammal medium	3
9	mammal large	2
	Feature 9 Total Identified	43
11	drum	1
11	box turtle	2
11	indet. turtle	24
11	indet. snake	1
11	cottontail	3
11	swamp or jack rabbit	1
11	squirrel	1
11	pocket gopher	1
11	indet. rodent	1
11	deer/pronghorn	1
11	mammal small	7
11	mammal medium	4
11	mammal large	1
	Feature 11 Total Identified	48
12	catfish	2
12	indet. fish	2
12	indet. turtle	4
12	indet. snake	2
12	indet. rodent	1
	Feature 12 Total Identified	11
13	fish large	1
13	cottontail	1
13	indet. rodent	1
13	mammal medium	2
	Feature 13 Total Identified	5
14	indet. turtle	2
14	mammal small	7
14	mammal medium	1
14	mammal large	1
	Feature 14 Total Identified	11
16	cottontail	1
16	deer/pronghorn	1
16	mammal medium	1
	Feature 16 Total Identified	3
17	indet. turtle	3
17	deer/pronghorn	3
17	mammal small	1
17	mammal large	2
	Feature 17 Total Identified	9

*Includes fauna from testing phase.

Table C1. Faunal Coding Form

column	information
1	site type (not used)
2	county (1=Denton, 2=Cooke, 3=Grayson)
3-5	site number (sequential within the county)
6	block number (sequential within the site)
7-9	unite·number (stratigraphic unit within the block)
10-11	excavation level number (sequential within the block)
12-14	base of level below site datum in cm
15	quad number (1=NW corner of 1x1 m, 2=NE corner of 1x1 m, 3=SE corner of 1x1 m, and 4=SW corner of 1x1 m)
16-17	feature number (sequential within the block or level)
18-21	south axis coordinate from site datum in m
22-25	east axis coordinate from site datum in m
26	recovery (not used)
27-28	number of identified specimens
29-31	number of unidentified, unburned specimens
32-34	number of unidentified, burned specimens
35-40	weight of unidentified bone to nearest 0.1 gram
41-44	lot number (assigned in the field)

The following key was used for recording identified bone. The first 26 columns are the same as those above for unidentified bone.

Table C2. Faunal Coding Key

column	information
27	class
28-30	taxon 000=unidentifiable 100=Homo sapiens 101=Insectivora (insect) 001=Indeterminate fish 002=Fish (sp.) large 003=Fish (sp.) small 004=Lepisosteus sp. (gar) 005=Amia calva (bowfin) 006=Ictaluridae (catfishes) 007=Aplodinotus grunniens (drum) 008=Catostomidae (suckerfishes) 010=Centrarchidae (bass/sunfishes) 011=Centrarchidae (cf*) 015=Dorosoma sp. (shad) 017=Esocidae (pikes/pickerels) 018=Mugil cephalus (striped mullet) 020=Anura (toad/frog sp.)

021=Frog (sp.)
022=_Rana catesbiana_ (bullfrog)
023=Anura (cf*)
024=Bufonidae (toads)
025=Caudata (salamander sp.)
026=Caudata (cf*)
027=Ambystomatidae (mole salamanders)
030=_Chrysemys_ sp. (slider turtle)
031=Chelydridae (snapping turtles)
032=Kinosternidae (musk/mud turtles)
033=_Terrapene_ sp. (box turtle)
034=_Trionyx_ sp. (softshell turtle)
038=Testudines (cf*)
380=_Kinosternon_ sp. (mud turtle)
381=_Sternothaerus_ sp. (musk turtle)
382=_Graptemys_ sp. (map turtle)
383=_Chrysemys scripta_ (red-eared turtle)
039=Indeterminate turtle
040=Indeterminate snake
401=_Elaphe_ sp. (rat snakes)
041=Colubridae (non-poisonous snakes)
042=Viperidae (vipers)
043=_Nerodia_ sp. (water snake)
045=Serpentes (cf*)
046=_Sceloporus olivaceus_ (Texas spiny loizard)
047=_Phrynosoma_ sp. (horned lizard)
048=Indeterminate lizard
049=Lacertilia (cf*)
490=_Cnemidophorus_ sp. (whiptail lizard)
050=Anseriformes (ducks/geese)
053=_Colinus virginianus_ (bobwhite quail)
054=_Ardea herodius_ (great blue heron)
544=_Florida caerulea_ (little blue heron)
545=_Bubulcus ibis_ (cattle egret)
546=_Sternella_ sp. (meadowlark)
547=_Philohela minor_ (woodcock)
548=_Zenaidura macroura_ (mourning dove)
549=Cathartidae (vultures)
055=_Tympanuchus_ sp. (prairie chicken)
550=_Buteo jamaicensis_ (red-tailed hawk)
551=_Richmondena cardinalis_ (cardinal)
552=_Sternella_ sp. (meadowlark)
553=Strigiformes (owls)
554=_Fulica americana_ (coot)
555=_Gallus gallus_ (domestic chicken)
556=Raptor
056=_Meleagris gallopavo_ (wild turkey)
057=Accipitridae (hawks)
571=_Accipiter_ sp. (small hawks)
572=_Buteo_ sp. (large hawks)
059=Bird (sp.) large
060=Bird (sp.) medium
061=Bird (sp.) small
064=Picidae (woodpecker)

066=Passeriformes (perching birds)
069=Aves (cf*)
070=_Didelphis virginianus_ (opossum)
700=Indeterminate rodent
071=Soricidae (shrews)
710=_Scalopus aquaticus_ (eastern mole)
072=Chiroptera (bats)
073=_Dasypus novemcinctus_ (armadillo)
074=_Sylvilagus floridanus_ (eastern cottontail)
075=Swamp or jack rabbit
751=_Sylvilagus aquaticus_ (swamp rabbit)
752=_Lepus californicus_ (black-tailed jack rabbit)
076=Sciuridae (squirrels)
761=_Sciurus niger_ (fox squirrel
762=_Sciurus carolinensis_ (gray squirrel)
763=_Spermophilus_ sp. (ground squirrel)
764=_Glaucomys voflans_ (so. flying squirrel)
765=_Cynomys ludovicianus_ (black-tailed prairie dog)
077=_Geomys bursarius_ (plains pocket gopher)
777=_Oryzomys palustris_ (rice rat)
778=_Reithrodontomys_ sp. (harvest mouse)
779=_Onychomys_ sp. (grasshopper mouse)
078=_Perognathus_ sp. (pocket mouse)
079=_Peromyscus_ sp. (deer mouse)
799=Rodentia (cf*)
080=_Castor canadensis_ (beaver)
800=Mammalia (cf*)
081=_Neotoma_ sp. (woodrat)
811=_Rattus rattus_ (black rat)
082=_Sigmodon hispidus_ (cotton rat)
083=_Microtus_ sp. (vole)
084=Mammal (sp.) small
085=Canidae (dogs)
851=Carnivora (carnivores)
885=_Canis familiaris_ (domestic dog)
856=_Canis latrans_ (coyote)
086=_Procyon lotor_ (raccoon)
087=_Mephitis mephitis_ (striped skunk)
870=Mustelidae (mustelids)
877=_Mustela vison_ (mink)
088=Mammal (sp.) medium
880=_Vulpes_ sp. (fox)
888=_Urocyon cinereoargenteus_ (gray fox)
089=Felidae (cats)
090=_Taxidea taxus_ (badger)
900=Deer or pronghorn
901=Probably deer
902=_Cervus elaphus_ (wapiti)
903=_Bos taurus_ (domestic cattle)
904=Deer or wapiti
091=_Ursus americanus_ (black bear)
092=_Sus scrofa_ (dodmestic or feral pig)
093=Sheep or goat
936=Ovis/Capra/Antilocapra

094=Mammal (sp.) large
095=*Odocoileus virginianus* (white-tailed deer)
096=*Antilocapra americana* (pronghorn)
097=Bos/Bison/Cervus
098=*Bison bison* (American bison)
099=*Equus caballus* (horse)
999=Crayfish

31 side
1=right
2=left
3=axial
4=indeterminate

32-34 element
001=horn core/antler
002=cranium
222=dentary
003=mandible
004=tooth permanent maxillary
005=tooth permanent mandibular
006=tooth deciduous maxillary
007=tooth deciduous mandibular
008=tooth permanent (maxillary or mandibular)
009=tooth deciduous (maxillary or mandibular)
010=sternum
011=hyoid
012=petrous
013=jugal
131=squamosal
014=maxilla
015=clavicle/cleithrum
016=coracoid
017=scapula
018=furculum
019=eggshell
020=humerus
021=ulna
022=radius
023=radius and ulna
024=carpal
241=lunate
242=unciform
243=trapezoid/magnum
244=pisiform
245=scaphoid
246=cuneiform
025=carpometacarpus
256=navicular
260=cuboid
026=nasals
027=tooth?
270=tooth mandibular (deciduous/permanent)
271=tooth maxillary (deciduous/permanent)
028=carpal/tarsal?
030=metacarpal

301=1st metacarpal
302=2nd metacarpal
303=3rd metacarpal
304=4th metacarpal
305=5th metacarpal
031=phalange?
032=phalange 1
033=phalange 2
034=phalange 3
035=pollux/dew claw III
351=dew claw I
352=dew claw II
036=tibiotarsus
038=sesamoid
039=metapodial
040=ilium
041=ischium
042=pubis
043=acetabulum with ischium
044=acetabulum with pubis
045=os penis
046=acetabulum with ilium
047=acetabulum socket only
477=innominate
048=femur
049=patella
050=tibia
051=fibula
052=tibiofibula
053=lateral malleolus
054=astragalus
055=calcaneum
056=other tarsals
057=tarsometatarsals
058=metatarsals
581=1st metatarsal
582=2nd metatarsal
583=3rd metatarsal
584=4th metatarsal
585=5th metatarsal
059=dew claw splint
060=naviculocuboid
061=proatlas
062=atlas
063=axis
064=epistrophus
065=second vertebra
066=cervical
661=3rd cervical
662=4th cervical
663=5th cervical
664=6th cervical
665=7th cervical
067=thoracic

068=lumbar
069=caudal
070=coccygeal
071=pygostyle
072=precaudal
073=penultimate
074=ultimate
075=vertebra I.D. ?
076=sacrum
077=urostyle
080=ribs
081=long bone (non-mammal)
082=long bone (mammal)
083=crayfish claw
084=turtle infraskeleton
085=turtle carapace
086=turtle plastron
861=hyoplastron
862=hypoplastron
863=epiplastron
864=xiphiplastron
865=keratin scute
866=pleural
867=entoplastron
868=neural
869=suprapygal
870=pygal
871=peripheral
087=turtle shell
088=mammal exoskeleton
888=long bone
089=nuchal
090=lepidotrich
091=axonost
092=anterior anal spine
093=pterygiophore
094=spine I.D.?
095=scale
096=otolith
097=pectoral spine
098=ray
099=fragment (with modification)

35-36 aspect
01=complete
02=proximal
03=distal
04=proximal fragment
05=distal fragment
06=fragment
07=shaft fragment
08=condyle fragment
09=scapula neck
10=see inventory
11=incisor

12=premolar 1 or 2
13=premolar 3 or 4
14=premolar ?
15=molar 1 or 2
16=moloar 3
17=molar ?
18=tooth I.D.? complete
19=tooth I.D.? fragment
20=canine
21=root only
22=tooth row
23=molars 1-3
24=socket incisor
25=socket jaw
26=jaw without teeth
30=centrum epiphysis
31=centrum fragment
32=transverse process
33=vertebral or rib facet
34=neural spine
40=axial notch
41=ascending ramus
42=basal ramus
43=anterior protion
44=posterior portion
51=proximal posterior lateral
52=proximal posterior medial
53=proximal anterior lateral
54=proximal anterior medial
55=proximal shaft
56=central shaft
57=distal shaft
58=distal anterior lateral
59=distal anterior medial
60=distal posterior lateral
61=distal posterior medial
62=proximal epiphysis
63=distal epiphysis
64=proximal half
65=distal half
66=long bone splinter
67=no proximal epiphysis
68=no distal epiphysis
69=proximal third
70=distal third
71=proximal lateral
72=proximal medial
73=proximal anterior
74=proximal posterior
75=distal lateral
76=distal medial
77=distal anterior
78=distal posterior

37-38 age

01=indeterminate
02=adult
03=foetal/neo-natal
04=fused element but small
05=sub-adult
09=unfused epiphyseal
19=< 1 year
20=1-1.5 years
21=2-3.5 years
22=4-6.5 years
23=> 7 years
25=slight tooth wear
26=moderate tooth wear
27=advanced tooth wear
28=open roots no wear
30=rugose adult

39-40 condition
01=not burned
02=white
03=blue/gray
04=internal only
05=red-brown
06=shiny black
07=charred
08=differential
09=partly calcified
11=flat black
12=partially petrified
13=green or blue

41-42 modification
01=none
02=tool
03=worked piece-grooved
04=worked piece-polished area
05=slight cut
06=deep cut
07=ring and snap cut (prepared)
08=ring and snap cut (complete)
09=bitumen present
10=possibly worked
11=impact depression
12=sliced
13=sawed
14=pitted
15=shiny, polished
16=charred break
17=ground
18=ochre present
19=charred breakf and cuts
20=skinning marks
21=dismembering
22=filleting
23=see notes

43-44 taphonomy

00=no evidence of weathering
01=long cracks
02=exfoliated
03=patches of complete exfoliation
04=fiberous with splinters
05=large splinters, complete exfoliation
06=greasy fresh obvious intrusive
07=pressure splinters, unweathered
08=root etched
09=stained
10=etched and stained
11-17=etched + 1-7
21-27=stained + 1-7
31-37=etched and stained + 1-7
40=gnawed
41-49=gnawed + 1-9
50=gnawed + 32
52=gnawed + 12
53=gnawed + 13
54=gnawed + 23
55=gnawed + 31
56=gnawed + 65
57=gnawed + 11
58=gnawed + 33
59=gnawed + 34
60=rolled and worn

45-47 specimen number (sequential for unit and level)
48-51 lot number (assigned in the field)
52-54 count, number of specimens

APPENDIX D: LITHIC CODING FORMS

Table D1. Lithic Coding Form

column	information
21	artifact class
	1=debitage
	2=core
	3=blank/dart-spear point preform
	4=blank/arrow point preform
	5=bifacial tool
	6=indeterminate biface fragment
	7=unifacial tool
	8=ground or pecked stone
	9=varia
22-23	raw material
	01=indeterminate
	02=Ogallala Quartzite (fine grained)
	03=other quartzite (coarse grained)
	04=petrified wood
	05=novaculite (mily/opaque)
	06=jasper
	07=translucent chert
	08=chert A, gray with tan cortex
	09=chert B, black siliceous shale
	10=chert C, yellow
	11=sandstone
	12=other
	13=vein quartz (clear/white)
	14=ferruginous sandstone
	15=siltstone
	16=black/gray/dark brown Woodford chert
	17=quartzitic sandstone
	18=Big Fork chert, green variety
	19=red chert (non-heated)
	20=red ochre
	21=black chert
	22=translucent gray-blue, Johns Valley chert
	23=tan chert
	24=white fossiliferous chert
	25=white opaque chert
	26=obsidian
24	platform
	0=missing
	1=unfacetted
	2=facetted
	3=cortex present
	4=crushed
25	dorsal cortex
	0=indeterminate
	1=none
	2=1-25%

	3=26-50%
	4=51-75%
	5=76-100%
27-29	length in mm
30-32	width in mm
33-35	thickness to nearest 0.1 mm
36-38	tool number (sequential by excavation unit and level)
39	blank form
	0=indeterminate
	1=stream cobble
	2=nodule
	3=tabular
	4=reworked biface
	5=flake
40-41	chipped stone tool types
	00=core or ground stone tool
	01=dart/spear point
	02=arrowpoint
	03=gouge
	04=bifacial drill
	05=bifacial perforator
	06=unifacial perforator
	07=graver
	08=stemmed knife
	09=other knife (absence of discernible hafting)
	10=adze
	11=simple end scraper
	12=end scraper with retouch
	13=thumbnail scraper
	14=simple side scraper
	15=end and side scraper (disto-lateral scraper)
	16=uniface (scraper) resharpening flake
	17=biface resharpening/thinning flake
	18=unilateral retouched piece
	19=bilaterial retouched piece
	20=distal retouched piece
	21=distal-lateral retouched piece
	22=alternate retouched piece
	23=other retouch
	24=unilaterally utilized flake
	25=denticulate
	26=notch/spokeshave
	27=simple burin
	28=burin on biface
	29=multiple tools (composite tools)
	30=varia
	31=bilaterally utilized flake
	32=distally utilized flake
	33=distally-laterally utilized flake
42-43	tool types, ground stone
	01=simple unifacial mano
	02=simple bifacial mano
	03=mano and pitted stone
	04=simple metate

	05=prepared metate
	06=hammerstone
	07=pitted stone
	08=celt
	09=grooved abrader
	10=other
44-45	core types
	01=tested cobble
	02=core-blank-preform
	03=single platform flake
	04=opposed platform flake (bipolar)
	05=multiple platform flake
	06=discoidal
	07=single platform blade
	08=opposed platform blade
	09=gobular
	10=core fragment
	11=other
46-47	blank-preform types
	01=bifacial point preform
	02=unifacial point preform
	03=indeterminate preform
	04=other
48	flake decortication (not used)
49	tool part
	1=complete
	2=proximal fragment
	3=medial fragment
	4=distal fragment
	5=indeterminate
50	flake Type (not used)
51-56	weight to nearest 0.1 g
57-59	working edge angle
60	heat Treatment
	1=no
	2=yes
61-65	lot Number (assigned in the field)

Arrowpoint Types

type #	name
1	Hayes-like
2	Bonham-like
3	Perdiz-like
4	Bassett-like
5	Alba-like
6	Friley-like
7	Scallorn-like
8	Fresno-like
9	Washita-like
10	Young-like
11	Maud/Talco-like

12	Hays-like, prominent barbs, bulber base
13	expanding stem, rounded base, shoulders
14	Livermore-like
15	Clifton-like
16	Catahoula-like
17	Toyah-like
18	Keota-like
19	Starr-like
20	Harrell-like
21	Huffaker-like
22	straight stem, prominent shoulders, straight to slightly rounded base
23	one side/corner notch, asymmetrical, straight base
24	expanding stem, concave base, minimally modified flake blank
25	corner-notched, straight base, basal notch
26	expanding stem, concave base, rounded shoulders
27	Colbert-like
28	asymmetrical blade, expanding stem, rounded base
29	asymmetrical serrated blade, expanding stem, straight base
30	asymmetrical blade, expanding stem, concave base
31	triangular point with slight shoulders, wide rounded stem
32	Garza-like
33	triangular point with expanding base, concave base

Point types are from Turner and Hester (1985), Bell (1958, 1960), and Perino (1968, 1971).

Dart/Spear Point Types

type #	name
1	Gary-like, narrow contracting stem, prominent shoulders, round base
2	Gary-like, contracting stem, prominent shoulders, straight base
3	Gary-like, broad contracting stem, prominent shoulders, rounded to straight base
4	Kent-like
5	Dallas/Langtry-like
6	Gary-like, broad contracting stem, no shoulders, rounded base
7	Morrill/Kent-like
8	Gary-like, broad contracting stem, rounded base, prominent barbs
9	Wells-like
10	Palmillas-like
11	Fairland-like
12	expanding stemmed, straight base, shoulders
13	Marshall-like
14	Martindale/Edewood-like

15 Ensor-like
16 Elam/Travis-like
17 Yarbrough-like
18 Carrolton/Langtry-like
19 Ellis-like
20 leaf-shaped, small side notched, expanding stem
21 Godley/Trinity-like
22 Pedernales-like
23 Refugio-like
24 Kinney-like
25 Pandale-like
26 expanding stem, concaved base, rounded shoulders
27 lanceolate shaped, slightly contracting stem, straight base
28 Meserve-like
29 straight stem and base, square shoulders
30 straight stem, concave base
31 Bulverde-like
32 Neches River-like
33 Darl-like
34 concave base, concave blade, pointed barbs
35 slight rounded shoulders, broad contracting stem, rounded base
36 a single side-notch, straight stem and base
37 Castroville-like
38 asymmetrical contracting stem, straight to rounded base
39 Motley-like

Point types are from Turner and Hester (1985), Bell (1958, 1960), and Perino (1968, 1971).